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JPRS-UST-88-009

CONTENTS

18 JULY 1988

Organization, Planning, Coordination

BUDGET, FINANCE

FACILITIES, MANPOWER

TRAINING, EDUCATION

AUTOMATION, INFORMATION POLICY

PATENTS, INVENTIONS

INTERNATIONAL S&T RELATIONS

REGIONAL ISSUES

CONFERENCES, EXPOSITIONS

AWARDS, PRIZES

GENERAL

BIOGRAPHIC INFORMATION

RSFSR Council of Creative Scientific, Technical Work of Youth

18140158 Moscow SOBRANIYE POSTANOVLENIY PRAVITELSTVA ROSSIYSKOY SOVETSKOY FEDERATIVNOY SOTSIALISTICHESKOY RESPUBLIKI in Russian No 18, 1987 pp 388-390

[Decree No 372 of the RSFSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee of 14 September 1987, "On the Formation of the All-Russian Coordinating Council of Creative Scientific and Technical Work of Youth"]

[Text]

Article 123. On the Formation of the All-Russian Coordinating Council of Creative Scientific and Technical Work of Youth

For the purposes of the further development of the labor activity of youth the RSFSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee resolve:

To form the All-Russian Coordinating Council of Creative Scientific and Technical Work of Youth with a staff in conformity with the appendix.

[Signed] Chairman of the RSFSR Council of Ministers V. Vorotnikov

Chairman of the All-Union Central Council of Trade Unions S. Shalayev

Secretary of the All-Union Komsomol Central Committee V. Mironenko

Moscow, 14 September 1987. No 372.

Appendix to Decree No 372 of the RSFSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee of 14 September 1987

Staff of the All-Russian Coordinating Council of the Creative Scientific and Technical Work of Youth

Chairman of the Council

Chekarin, Ye.M.—Deputy Chairman of the RSFSR Council of Ministers

Deputy Chairmen of the Council

Arzhavkin, S.A.—head of the Department of Mass Production Work and Wages of the All-Union Central Council of Trade Unions

Kotelnikov, V.A.—vice president of the USSR Academy of Sciences, academician

Kurakin, B.Ye.—Deputy Chairman of the Committee for Inventions and Discoveries attached to the USSR State Committee for Science and Technology

Mashyanov, N.P.—First Deputy Chairman of the RSFSR State Planning Committee

Sleptsov, N.S.—head of the Department of Creative Scientific and Technical Work of Youth of the All-Union Komsomol Central Committee, candidate of economic sciences

Shatilov, I.S.—Chairman of the Presidium of the All-Russian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, Deputy Chairman of the RSFSR State Agroindustrial Committee, academician of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin

Responsible Secretary of the Council

Generalov, M.V.—prorector for scientific work of the Moscow Institute of Chemical Machine Building, doctor of technical sciences

Members of the Council

Alekseyev, A.S.—director of the Computer Center of the Siberian Department of the USSR Academy of Sciences, academician

Alekseyev, O.B.—First Deputy Chairman of the RSFSR State Committee for Material and Technical Supply

Afanasyev, P.P.—First Deputy Chairman of the RSFSR State Committee for Vocational and Technical Education, candidate of technical sciences

Demin, V.A.—First Deputy Chairman of the Central Committee of the USSR Voluntary Society for the Promotion of the Army, Aviation, and Navy

Zabrodin, D.M.—RSFSR Deputy Minister of Education, candidate of historical sciences

Kedrovskiy, O.V.—chief of the association for the supervision of scientific and technical information and propaganda in the RSFSR attached to the USSR State Committee for Science and Technology, candidate of chemical sciences

Kostyuk, V.V.—chief of the Consolidated Department of Science and Technology of the RSFSR State Planning Committee, doctor of technical sciences

Labetskiy, K.I.—First Deputy Chairman of the Leningrad City Soviet Executive Committee

Levchuk, D.M.—Deputy Chairman of the All-Union Council of Scientific and Technical Societies, candidate of technical sciences

Lipanov, A.M.—RSFSR Deputy Minister of Higher and Secondary Specialized Education, doctor of technical sciences

Maksimov, V.I.—chief of Leningrad Production Association of Bus Transportation No 5 of the RSFSR Ministry of Motor Transport, candidate of technical sciences

Malyshev, N.G.—rector of the Taganrog Radio Engineering Institute of the RSFSR Ministry of Higher and Secondary Specialized Education, doctor of technical sciences

Podkopayev, A.N.—student of Tula Polytechnical Institute of the RSFSR Ministry of Higher and Secondary Specialized Education

Popov, Yu.A.—fitter of the Moskva Production Sewing Association of the RSFSR Ministry of Light Industry

Sarafanov, G.V.—Deputy Chairman of the Board of the RSFSR Society for Knowledge, candidate of technical sciences

Uspenskiy, V.A.—director of the Scientific Research, Design, and Technological Institute of Local Industry of the RSFSR Ministry of Local Industry (Gorkiy)

Chuyenko, A.M.—director of the center of creative scientific and technical work of youth attached to the Zelenogradskiy Rayon Committee of the All-Union Komsomol

Shkiryatov, V.V.—director of the Academy of Municipal Services imeni K.D. Pamfilov, doctor of technical sciences, honored inventor of the RSFSR

Yuzhina, V.B.—secretary of the Central Council of the All-Union Society of Inventors and Efficiency Experts, candidate of economic sciences

7807

Improvement of Forms of Intersectorial Management

18140182 Moscow NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA NAUKA I TEKHNIKA UPRAVLENIYA in Russian No 7, Jul 87 (signed to press 29 May 87) pp 1-64

[Pamphlet by Candidate of Economic Sciences Oleg Alekseyevich Nekrasov, docent of the Chair of the Management of Socioeconomic Processes of the Academy of Social Sciences attached to the CPSU Central Committee: "Sovershenstvovaniye form mezhotraslevogo upravleniya" [The Improvement of the Forms of Intersectorial Management]]

[Text] The author: Oleg Alekseyevich Nekrasov, candidate of economic sciences, docent of the Chair of the Management of Socioeconomic Processes of the Academy of Social Sciences attached to the CPSU Central Committee. He deals with problems of the improvement of the management of the national economy.

Annotation

The new methods of management, which are aimed at the accomplishment of the demands of the 27th CPSU Congress in the area of the development of the economy, are examined in the pamphlet. Particular attention is devoted to the problems of the improvement and the practice of the introduction of forms of intersectorial management, as well as to the functions of ministries and departments in the formulation and pursuit of the unified science and technology policy.

The pamphlet is intended for economic managers of various levels, lecturers, instructors, and students of people's universities and the system of economic education.

Introduction

The improvement of the management of the development of the USSR national economy is a natural process, which is inseparably connected with the profound qualitative changes that are occurring in the economy of the country. These changes are dictated by the acceleration of socioeconomic growth and the changeover to the intensification of production on the basis of the introduction of promising achievements of scientific and technical progress. The strategic policy of the party is not the partial improvement of the management of the national economy, but the radical restructuring of management, which makes it possible to implement the reserves available in the country, to reorient the system of management with the commitment of additional resources for their most efficient use, and to change the expenditure nature of the economic mechanism.

The content of the radical reform of economic management, which is being carried out, as was noted at the 27th CPSU Congress, consists in "subordinating in practice all our production to social needs and to the meeting of the needs of people and in aiming management at the increase of efficiency and quality, the acceleration of scientific and technical progress, and the development of the interest of workers in the results of labor and initiative and socialist enterprise in every unit of the national economy, and first of all in labor collectives."[1]

The main demand, which is being made on the restructuring of the management of the development of the national economy, is its comprehensiveness. Each individual direction of such restructuring cannot yield a significant impact, however important it seems. Therefore, the program of the comprehensive improvement of the economic mechanism, which is being formulated, encompasses all its units: the organizational structures of management, the planning and material and technical supply of production, the system of the economic stimulation and financing of its development.

What are the basic elements of this system? They are clearly specified in the documents of the 27th CPSU Congress and include:

—the increase of the effectiveness of the centralized management of the economy and the increase of the role of the center in the realization of the most important goals of the economic strategy of the party and in the assurance of the balance of the development of the national economy;

—the broadening of the independence of associations and enterprises and the increase of their responsibility for the end results of work;

—the improvement of the organizational structures of management, including intersectorial management;

—the development of economic methods of management at all levels of the national economy;

—the assurance of the optimum combination of sectorial and territorial management of the economy and the comprehensive economic and social development of regions;

—the further democratization of management and the increase in it of the role of labor collectives and control from below.

As we see, it is a question of an integral set of interconnected steps on the improvement of the management of the economy of the country, in which the development of the organizational forms of management, which form the internal structure of the economic system, holds an important place. That is precisely why it is important, without limiting ourselves to the analysis of the basic trends of the restructuring of the economic mechanism, to examine each of these directions, which is connected with the implementation of new approaches in management. One of them is the improvement of intersectorial management, which we will also examine in the offered pamphlet.

The Problems of the Improvement of Intersectorial Management

The elaboration of a set of steps on the realization of the intersectorial approach when implementing the program of the acceleration of socioeconomic development at all levels of the national economy is one of the characteristic features of the economic work that is now being performed in our country. While noting the role of intersectorial management as an important direction of the restructuring of the economic mechanism, which is being carried out, General Secretary of the CPSU Central Committee M.S. Gorbachev in the Policy Report to the 27th party congress stressed that it is necessary "to give management modern organizational structures with allowance made for the trends of the concentration, specialization, and cooperation of production. It is a question of the establishment of complexes of interconnected sectors, interbranch scientific technical centers, various forms of economic associations, and territorial production formations."[2]

The economic significance of the intersectorial approach to the accomplishment of specific national economic tasks is determined first of all by the fact that the quality of such management to a significant degree predetermines the resultant indicators of the development of the entire national economic complex of the country. Intersectorial management makes it possible to overcome the limitedness of the sectorial management of the development of specific works and affords the opportunity to link them with the expansion of the enterprises, which are cooperating with them, and to ensure the efficient interaction of ministries with each other and with territorial organs of management. The systematic establishment of new enterprises, which is a consequence of the further development of the sectorial division of labor and the formation of new sectors in the structure of the national economy, the sharply increasing complexity and intensity of economic relations between enterprises, the need for the comprehensive use of the economic and natural resources of the region, on the territory of which works are being located—all this requires an intersectorial approach, which ensures the achievement of not the sectorial or territorial, but the national economic criteria of production efficiency.

V.I. Lenin directed particular attention to this circumstance: "The lack locally of the coordinated work of various departments is one of great evils which hinder economic construction. It is necessary to direct immense attention to this question.... Foodstuffs—small-scale local industry—fuel—large statewide industry and so on, all these sectors are closely connected, and the 'departmental' division of them, which is necessary for the government of the state, will do harm, if work on coordination and the elimination of frictions, red tape, departmental narrow-mindedness, and conventionalism is not constantly performed."[3]

Without denying the significance of the sectorial management of the development of individual economic complexes (sectors or enterprises and associations), intersectorial management makes it possible to pursue statewide interests and to ensure their priority in comparison with the interests of individual enterprises and sectors. The intersectorial approach, which is consistently implemented at all levels of management, in the end is aimed at the formation of the optimum structure of the national economy, moreover, this optimality not only is characteristic of the structure of the economy as the result of intersectorial management, but also concerns the expenditures of manpower, financial, and material resources, which have been consumed (or are used) for the achievement of the planned production volumes.

The sectorial and regional units of the unified national economic complex interact on the basis of intersectorial management. The effectiveness of such management in many respects determines the end results of production, characterizing the extent of use of economic laws and the decree of realization of their requirements in the practice of economic management. Hence it follows that the effectiveness of the organizational forms of intersectorial management is dictated by the influence of the organizational structure of intersectorial management on the quality of the activity of the object being managed. Therefore, when elaborating new forms of intersectorial management it is necessary to evaluate comprehensively their objective necessity and the qualitative changes in productive forces, economic relations, and the methods and technology of planning, which occurred during a specific period. And only the consideration of these changes and the careful preparation of the restructuring of the forms of the organization of management make it possible to use their advantages.

What are the economic organizational advantages of the intersectorial management of the development of interconnected works? Specifically it ensures: the formation of the optimum internal structure of the complex of associated sectors on the basis of their interconnected and balanced development; the pursuit of a unified state science and technology policy of the development of the complex, the assurance of the high quality of its products, and the improvement of the material and technical base; the organizational integration of science and production; the aim of all enterprises and sectors, which are a part of the complex, at a high end national economic result; the increase of the soundness of the distribution of capital investments; the increase of the scientific level of planning and the degree of soundness of the plans of development of the complex and the improvement of its material and technical supply; the creation of the organizational prerequisites for the improvement of the economic mechanism, the system of economic norms and standards, levers and stimuli, and the forms of the remuneration of labor and the improvement of pricing; the development of the forms of the organization of production and the cooperation of labor.

The most important role in the practical realization of the intersectorial approach and its potentials and advantages belongs to the organizational structures of sectorial management. Without exhausting the entire content of intersectorial management, its organizational structures form the skeleton and determine the boundaries of the complex, within which its unified, internal interconnected development is planned and the corresponding economic mechanism is developed—a set of economic levers and stimuli, norms and standards, which direct attention to the achievement of high end results of the functioning of the complex, "the use of intensive factors of the development of production, the acceleration of scientific and technical progress, the most complete meeting of social needs."[4]

In this connection let us name several demands, which are being made on the organizational forms and structures of intersectorial management and which are bound to be strictly observed.

First, they should conform precisely to the real object of management, encompassing the groups of sectors and enterprises or the types of activity, the aggregate of which forms a specific technical and economic whole. This demand is realized, for example, in case of the distinction within industry of the machine building and the fuel and power complexes, the production of construction materials and chemical products, as well as the mineral raw material base of industry. Such a grouping of sectors of industry was given for the first time at the 27th party congress. This was done in order to determine the composition of the sectors of industry, which are characterized by a certain similarity or interchangeability of the output being produced, that is, the list of closely interconnected sectors.

The multivariant nature of the technical solution of a specific problem should be evaluated first of all with allowance made for the economic efficiency of each of the variants and the availability of the resources (material and raw material, manpower, financial), which are necessary for their implementation, while these resources often are very limited. For example, the need for construction materials can be met both by the increase of the output of rolled ferrous metal products and by the rapid development of the production of plastics and polymer materials, 1 ton of which replaces 3 tons of rolled metal products. In this case the correct decision on by what means to meet the need of the economy for construction materials can be made only during intersectorial management, which is based on intersectorial comparisons of the effectiveness of the choice of one technical variant or another, which will predetermine the corresponding distribution of capital investments.

That is why in case of the formation of the organizational structures of intersectorial management it is so important to ensure the qualified singling out of the corresponding groups of sectors or enterprises as the object of management. Here it is necessary to specify clearly the tasks of the managing system, its place in the entire structure of management, the functions, powers, and responsibility of each unit of those which constitute the new form of the organization of management and to ensure the efficient coordination of their activity.

Second, the organizational structures of intersectorial management should be characterized by flexibility. They should be capable of adapting to the changing conditions of production and to the new social needs of the development of society or an individual collective. The less predictable the changes in the managed object are, the more flexible the forms of the organization of management should be.

The acceleration of scientific and technical progress requires quick reaction to the newly appearing needs which are connected with its support. The ever expanding cooperation of production, of which the specialization of enterprises in the output of individual parts or in the performance of individual technological operations acts as the objective basis, led to the formation of a most complex mass of economic ties and relations even at the level of individual enterprises. For example, the modern machine tool building, tractor, or motor vehicle plant, which puts out a technically simple product, cooperates in its production with 1,500-3,000 other enterprises and associations, obtaining from them up to 15,000-20,000 descriptions of raw materials, materials, and semifinished products. Under such conditions the changeover to the output of a new model of a motor vehicle, machine tool, or tractor, which is accompanied by the sweeping away of established economic ties and the formation of new ones, takes place under complex conditions. The upsetting of the deadlines of the assimilation of new items and, hence, the failure to fulfill the production plans, as a rule, are due to the untimely delivery or in general the failure to deliver components, since the breaking of the ties of cooperation along the entire technological chain of works occurs very often.

All the greater difficulties arise in the process of the development of the social division of labor, when new sectors, for the assurance of the normal functioning of which the products of related works, which include many tens of thousands of descriptions of various items, are needed, appear in the structure of the national economy. The formation of new sectors, and they are often connected with the most advanced directions of scientific and technical progress, requires not only the delivery from related industries of their traditional products, but also the changeover to new types of them, which is responsible for the further development of the intrasectorial specialization of production and the appearance of new subsectors.

Under such conditions the role of the organizational forms of intersectorial management is exceptionally great, since precisely these forms contribute to the assurance of the acceleration of scientific and technical development. Consequently, the improvement of the organizational structure of intersectorial management in conformity with the changing conditions of production is not a one-time, but a constant dynamic process.

At the same time the improvement of the structures of management cannot be an end in itself. As V.I. Lenin wrote, it is important "not to begin all over again, not to restructure right and left, but to know how to use what has already been created. To implement as few changes as possible and as many efficient, practically tested steps, techniques, methods, and instructions as possible, which have been verified by the already achieved results, for the achievement of our main goal...."[5] Thus, the dynamics of the organizational forms of management should be objectively readied either by changes in the object of management, which are due to the expansion of its boundaries or the emergence of new tasks, or by changes in the managing system itself, which affect its information or technical base.

Third, the organizational forms of intersectorial management should conform to the specific national economic level of the tasks being accomplished. If the singling out of a large block of interconnected sectors (for example, the transportation complex) requires the organization of management at the statewide level, the supervision of these works on the regional level should be accompanied by the corresponding organizational support of the optimization of transportation connections within the union republic or large economic region. As applied to the machine building complex we can speak of its management at the national economic level and the regional level, which is supported by the establishment of a network of large production associations, which include similar or related enterprises of the sector, which are located on a relatively limited territory.

Fourth, the formation of new organizational forms of intersectorial management in all instances should be connected with the solution of a specific national economic problem. Environmental protection, the completeness of the use of mineral raw materials and other resources, and, finally, the quickest development, production, and introduction of a complicated scientific and technical innovation, which requires intersectorial interaction for implementation—all this is also responsible for the need for the appearance of new organizational forms, which contribute to the successful solution of this problem, if it cannot be solved under the conditions of the old organizational structure.

Fifth, the clear subordination of the functions of sectorial, territorial, and intersectorial organs of management should be ensured. Now, for example, the development of intersectorial works or items of intersectorial (general industrial, general machine building) use is planned in the system of the Ministry of the Machine Tool and Tool Building Industry. However, the specialized capacities of such works are meeting only half of the needs of the enterprises that belong to the ministry itself. The situation is even worse with the supply with tools, stampings, forge pieces, and so on of enterprises of other sectors, which are forced to engage in the independent production of standard parts. This is leading to the sharp increase of the production cost of items of intersectorial use, the deterioration of their quality, the impossibility of the use at nonspecialized works of advanced equipment and technology owing to the lack of conformity to their parameters of the capacities, the worsening of the conditions of labor, and its low productivity. In this case the natural intensification of the specialization of production and the expansion of its cooperation and the rapid development of the part, technological, and functional specialization of production lead to changes in the organization of production, which also requires the corresponding change in the forms of the organization of management.

The construction of new enterprises outside industrial centers and forming territorial production complexes also has similar consequences. The splitting, for example, of the construction complex of a region along sectorial organizations leads to the dispersal of the material and technical base of construction, to the incompleteness of development, and to enormous losses, which are connected with the "piecemeal" construction of enterprises and the rejection of the establishment of centerwide facilities.

Thus, the organizational forms of intersectorial management act as an active tool of the solution of intersectorial problems and the assurance of the unity of the sectorial and territorial development of the national economy on the scale of the entire economy and its regional structures. Here in the measures on the improvement of the sectorial management of the development of the economic or social complex its place and role in social production, its specific nature as an object of management, and the possibility of pursuing a unified technical policy should be taken into account.

Of course, the consideration of national economic and intersectorial requirements when making specific economic decisions is complicated by the sectorial structure of the management of production. Here it is important to stress the objective nature of such contradictions. They are often very acute and lead to significant national economic losses, not because one manager or another does not understand the negative consequences of the decision being made, but because owing to the distribution of management functions, which is insufficiently skillful (or no longer satisfies the requirements of today), he is forced to make intersectorial decisions, while continuing to hold a sectorial stand, proceeding from sectorial interests, and being guided by the sectorial criterion of optimality. Without granting to any extent amnesty to such a manager, it is nevertheless necessary to see the objective bases of the distortion of the national economic results, which are connected with the imperfection of the economic mechanism or the organizational structure of the management of production.

During the building of socialism the Communist Party and the Soviet Government always strove to ensure the maximum conformity of the organizational structure of the management of the development of the national economy to the real processes that were occurring in the economy. And this is natural, since the established form of the organization of management and its individual elements and units become obsolete. The increase of the production potential, which is ensured by the division of national labor and, in turn, influences it, the changeover to intensive factors of economic development, the changes in the structure of social production—all this requires the updating of the organizational forms of intersectorial management, which are aimed at the integration (combination) of separate individual processes. Here the more intensively the processes of sectorial (object) specialization develop, the more efficient the integration of the participants in production in its overall structure should be. V.I. Lenin directed attention to this circumstance when he spoke about the necessity of "the exemplary organization of a small 'whole,' but namely a 'whole,' that is, not one farm, not one sector, not one enterprise, but the sum of all economic relations, the sum of the entire economic turnover, if only of a small region."[6]

The second half of the 1960's and the 1970's in USSR history were marked by a sharp increase of attention to sectorial management. The reconstruction of ministries, the successful formation of a system of production (scientific production) associations, the failed experiments with the formation of all-union (republic) industrial associations, the systematic, but not always effective attempts, which were aimed at the broadening of the rights and the increase of the role of associations, their formation as the basic unit of social production—all this involved the substantial development of the organizational structure of sectorial management.

However, it was never possible to fully ensure the optimum distribution of management functions between enterprises and ministries. The ministries, in addition to strategic positions, also strove to preserve the tactical positions with respect to the management of the enterprises that were a part of them, by restricting the rights which had been granted to the latter. All this not only did not eliminate the ambiguity of the position of ministries as organs of state and economic management, which was seen quite clearly immediately after their formation, but also made their functions more contradictory. Acting as a representative of the state, which monitors the activity of the sectorial economic complex as a whole and the enterprises that are a part of it, the ministry as an economic organ at the same time was responsible for the successful work of this complex and its enterprises. Having the task to meet the need of the national economy for the products of this sector, the ministries systematically adjust the production plans, thereby upsetting the meeting of these needs and causing a shortage in the national economy. Therefore, despite the specific positive results that are connected with the improvement of the organizational forms of sectorial management, it is simply impossible to regard this work as finished.

At the same time in the past 20 years significantly less attention was devoted to the improvement of the organizational forms of intersectorial management. Of course, it would be incorrect to believe that such work was not performed at all. Territorial production complexes (TPK's) as a very effective tool of the development of new regions were and are of great importance. Here our country has unique experience in the accomplishment of large-scale economic tasks, which makes it possible to save up to 25 percent of the capital investments in the construction of common facilities, not

counting the impact of the decrease of operating expenses as a result of the optimization of the territorial production and transportation ties between enterprises of the complex.

And still for all the importance of territorial production complexes one must not confine intersectorial management only to them for three reasons: first, this is an organizational form of regional, and not general economic management; second, it does not exhaust the entire content of intersectorial management; third, territorial production complexes for the present are a form of the planning of the comprehensive development of a region and its construction, but not at all yet a form of the intersectorial management of functioning complexes.

Precisely for this reason the second half of the 1980's is characterized, along with the continuation of the work on the improvement of sectorial management, by the search for new forms of intersectorial management, which makes it possible to realize the enormous reserves of the increase of the efficiency of social production, which are found at the meeting points of sectors. These forms proved to be very diverse, and their practical implementation promises important economic results, which are connected with the possibility of making quick and effective management decisions.

However, the new organizational forms of intersectorial management will be completely effective only when they are efficiently subordinated with the sectorial structures of management. They cannot include all the functions of sectorial management and cannot replace it. The sharp expansion of the object of management is possible, as was observed in case of the establishment of the USSR State Agroindustrial Committee, but this does not signify at all the rejection of the planning of the intrasectorial structure of agriculture. In this case the establishment of the State Agroindustrial Committee envisaged the assurance of the integration of agriculture and the sectors of industry, which are connected with it.

Therefore, it is methodologically very important to specify the nature of the interaction of sectorial, territorial, and intersectorial organs of management. On the one hand, the intensively developing specialization of production is leading to the singling out in the structure of the national economy of newer and newer sectors. This especially applies to industry, within which there are now, according to the estimates of specialists, more than 400 sectors. On the other hand, along with the differentiation of production the integration processes in the national economy are intensifying just as drastically. In this lies the uniqueness of the qualitatively new stage of the development of the national economy under the conditions of the acceleration of the socioeconomic development of the country. The orientation of production toward the end result requires the organizational unification of technically related sectors, if the intensity of the economic relations between them is very high and "tears" one works or another from the old structure of management.

Thus, the ratio of the organizational forms of sectorial and intersectorial management is determined by the counteraction of two trends: the differentiation of works as a result of the social division of labor and their integration, which stems from the necessity of the management of the forming blocks of stable relations on the cooperation of closely interconnected enterprises of different sectors.

The formation of a system of the organization of management of the unified national economic complex of the country, which ensures the systematic cooperation of labor on the sectorial, territorial, and intersectorial levels, will be the logical result of the formation of new forms of intersectorial management in combination with the development of the organizational structure of sectorial and territorial management.

It is necessary to make an analysis of the conformity of the functions of sectorial organs to the trends, which are forming in the economy, in the different units of management: at the level of both the entire national economy and individual regions. So that it would be successful and would make it possible to answer unequivocally the question of the advisability of establishing organs of intersectorial management, it is necessary to specify the basic tasks and the content of the sectorial management of production, which is a unified technological, economic, and social complex, for the purpose of meeting the social needs for specific types of products. Sectorial management is called upon to ensure the coordinating and stimulating effect of the needs of society on the scientific, technical, production, economic, and social processes that occur in similar sectors. Here the sector acts as a part of the unified national economic complex.

In sectorial management it is possible to accomplish a number of technical and economic tasks, among which the most important ones are: the preferential development of "progressive" sectors of industry; the further improvement of the intrasectorial specialization of production; the pursuit of a unified state technical policy in sectors. The sectorial proportions in the development of all social production form as a result.

All the processes occurring in the sector are an object of influence on the part of the sectorial ministry. However, the concepts "sector" and "sectorial ministry," as a rule, are incommensurable, which is due to irregularities of the production specialization of sectorial economic complexes and their inclusion within works that produce products which are not characteristic of the sector. And this is already the first element that requires intersectorial regulation. According to the estimates of specialists, the proportion of noncharacteristic products even in

highly aggregated sectors came during the 11th Five-Year Plan to only 18 percent of the gross output, while for individual ministries this indicator is 2- to 2.5-fold higher.

Specific tasks, which are connected with the increase of the level of the concentration and centralization of production and with the optimization of the size of associations (enterprises), with the elimination of the multilevel nature and stage nature of their management, and with the improvement of the master diagrams of management, are accomplished in the process of sectorial management. The structure of sectorial management depends on the number of industrial facilities, the place of the sector in the national economy, its share in the value of the output being produced, the technical level of production, the complexity of territorial production relations, and other factors. In conformity with the decisions of the 27th CPSU Congress the changeover of the majority of sectors to a two- and three-level system of management is now beginning.

The above-named spheres of activity of ministries also make it possible to identify the things which are outside the competence of sectors, that is, which require intersectorial decisions. In addition to the mentioned despecialization of sectorial production, intersectorial management is necessary in case of the singling out in the structure of production of new sectors and the assurance of their technical, technological, and production connection, as well as interconnected development, that is, the meeting points between sectors. Finally, the assurance of the comprehensiveness of the development of the three most important spheres of the economy: intersectorial works, the production infrastructure, and the nonproduction sphere, require intersectorial management.

At the level of the entire national economy the USSR Council of Ministers and its functional committees (the USSR State Planning Committee, the USSR State Committee for Material and Technical Supply, the USSR State Committee for Labor and Social Problems, and the USSR Ministry of Finance) carry out the functions of intersectorial management. They settle the entire set of questions which are connected with the determination of the global macroproportions of social production (between subdivisions I and II of social production, the production and nonproduction spheres, industry and agriculture, group A and group B in industry, the formation of the structure of the most important blocks of sectors of the national economy). The resource and financial support of planned structural changes makes it possible to "materialize" these plans, which are aimed at the achievement of the conformity of the structure of production to national economic needs.

At the statewide level intersectorial management in the territorial respect makes it possible to carry out the supervision of the division of labor and the formation of the proportions of reproduction. The accomplishment of these tasks is achieved by the improvement of the distribution of production in conformity with the resources, which are available on one territory or another, by the efficient production specialization of economic regions of the country, and by the formation of large intersectorial territorial production complexes, which are of general economic importance.

What has been said also fully applies to the performance of the functions of intersectorial management by the councils of ministers of the union republics. Here, however, it is necessary to bear in mind one important circumstance. Under the conditions of the vastness of the territory of the USSR the problem of the equalization of the levels of economic development of different regions reduces not to the maximization or equalization of their growth rates, not to the duplication of the structure of social production, but to such an expansion of the production potential, which would ensure the maximum contribution of one republic or another to the achievement of the greatest production efficiency and its extensive specialization in the interests of the entire country. This, of course, does not signify the narrowing of the tasks of the intersectorial management of the comprehensive socioeconomic development of the union republic. They are most important and are supported organizationally by the activity of the councils of ministers of the republics and their functional intersectorial organs.

However, for all the importance of the all-union and republic levels of intersectorial management the latter cannot be limited just to them. It also plays an enormous role at other taxonomic levels of the regional structure of the country: the kray, autonomous republic, oblast, city, and city and rural rayon. The tasks of the intersectorial, interconnected development of works are accomplished through territorial management, which is not an alternate version of sectorial management, but complements it.

Territorial intersectorial management acts as a set of interconnected measures on the systematic influencing of social production, which is located on the given territory, in the interests of the increase of its efficiency. One of the main components of such management is its organizational forms, the specific choice of which is dictated by the specific nature of the tasks being accomplished on the regional level.

Let us immediately note that territorial management is broader than the concept of territorial intersectorial management. In the structure of territorial management it is possible to distinguish three aspects: the territorial management of the development of the unified national economic complex of the country; the territorial aspect to the management of the development of the sector; the management of the comprehensive economic and social development of the region (the economic region of the USSR, the kray, the oblast, the autonomous republic, the city, and so forth). Only the first aspect, which was spoken about above, and the third aspect of territorial

management are of an intersectorial nature. The plans of the distribution of sectorial production, which, incidentally, have been developed to the greatest degree, as a rule, are not connected with the accomplishment of intersectorial tasks.

The economic importance of territorial intersectorial management is determined by its orientation toward the efficient use of the natural resources (mineral raw material, fuel, land, water), the climatic conditions, as well as the manpower resources and the production, economic, scientific, and technical potentials of regions in the interests of the most effective development of the unified national economic complex of the country.

The entire economy of the region, which includes both the set of production sectors and the social infrastructure, regardless of the composition and departmental affiliation of associations, enterprises, social, cultural, and economic institutions, as well as scientific research and planning and design organizations, acts as the object of territorial intersectorial management.

The management of the economic and social development of regions of different taxonomic levels includes the intersectorial aspect and is aimed at the optimization of the territorial production and economic relations, which form in case of the "superimposing" of sectorial plans of the development and distribution of production on the territory of the region. It makes it possible to minimize the total expenditures, which are connected with the implementation of the sectorial plans of the development of production, and is called upon to accomplish the following tasks: the complete use of all types of natural and economic resources; the efficient territorial organization of production; the use of the advantages of the territorial concentration, specialization, cooperation, and combination of production; the determination of the optimum ratio between production and the production and social infrastructure; the formation of an efficient system of settlement; the solution of social problems that arise during economic growth.

Territorial intersectorial goal program management, which is a set of specific forms and methods of management and planning, which are aimed at the implementation of regional comprehensive programs, conforms to the greatest extent to the accomplishment of the indicated tasks of intersectorial management. The territorial intersectorial comprehensive program is a directive and address document, which specifies the interconnected socioeconomic, production, scientific research, organizational economic, and other measures, which are aimed at the realization of the problems, the solution of which requires the participation of a number of sectors, ministries and departments of the USSR and the union republics, as well as local authorities. Here all the enumerated steps can be coordinated with respect to resources, performers, and time of implementation. Thus, the comprehensive goal program can act as a new element of the organization of intersectorial interaction, since fundamentally new management tasks are accomplished in the structure of the program.

However, for all the importance of the organizational forms of intersectorial management and its organizational structure they by no means exhaust the content of intersectorial management. It also includes planning and the system of the economic stimulation of the development of production. It is well known, for example, that the cost of the production of items of intersectorial use in low-capacity shops and sections of nonmachine building enterprises exceeds the cost of such a product at specialized works. They are included in the expenditures on production in accordance with the actual production cost. If such items are delivered from outside, they are taken into account within the expenditures on production at a price which in a number of cases may prove to be greater than the cost of the internal production of the items. As a result the problem of the cost accounting "profitability" or "unprofitability" of the specialization of production, which does not conform to the real national economic efficiency of such steps, arises and a kind of economic barrier, which prevents the distinction and the subsequent territorial concentration of the production of similar items, appears.

Within a single enterprise and association the commodity forms of economic relations have been weakened. Internal (intraproduction) cost accounting by no means is based on the movement of commodities, while internal economic estimates, of course, do not take into account the total expenditures on the production of items. Therefore, in making decisions on the carrying out of the territorial specialization of works, it is necessary to proceed from the national economic estimates of the results of such steps, which conforms to the content and nature of intersectorial management.

At the same time the prices for the products of specialized works should stimulate economically the rejection of an inefficient structure of production. The tightening up of contractual discipline, the strict observance of the products list and the dates of deliveries, and the introduction of severe penalties for their violation will make it possible to reject the customary explanations of the reluctance of managers to do away with the general-purpose structure of production by certain psychological, and not economic factors, references to the danger of the disruption of deliveries of items, and so on. The real reason in such cases is the lack of interest in the decrease of the cost of the output being produced, the planned amount of which is formulated not on the basis of intersectorial norms and standards of expenditures, but on the basis of the formed actual spending, which drastically weakens anti-expenditure stimuli.

Precisely for this reason when carrying out the restructuring of the organizational forms of intersectorial management their precise conformity to the content of the new methods of planning and economic stimulation is

ensured. Thus, in making the decision on the restructuring of the management of the agroindustrial complex, the CPSU Central Committee and the USSR Council of Ministers stressed the importance of the new methods of management.

The analysis of the experience of using during the 11th Five-Year Plan comprehensive goal programs of scientific and technical progress in industry also showed that they had not fully become an effective subsystem of the organization of the management of scientific and technical progress, since the mechanism of their implementation—financial, resource, and manpower supply—in many respects remained the former, sector-by-sector mechanism. This requires the search for new forms of the intersectorial management of scientific and technical progress.

Now in the structure of the organization of the management of social production in the USSR it is possible distinguish several organizational forms of intersectorial management, which have as their object:

—large intersectorial economic complexes that include sectors, which belong to various spheres of social production—agriculture, industry, capital construction, material and technical supply, and the system of procurement—and are united into the structure of the agroindustrial complex of the country with the singling out of territorial sublevels;

—intersectorial economic complexes, which encompass enterprises of one sphere of social production, but are specialized by sectors: in the structure of industry—the machine building complex, the complex for the production of construction materials and chemical products, the fuel and power complex, the mineral raw material base of the national economy, consumer goods production, and the sphere of services; the construction complex with specialization according to the territorial production principle and with regionalization with respect to four zones of the country (the northern and western regions of the USSR, the southern regions, the Urals and Western Siberia, and the Transbaykal area and the Far East); transportation and communications;

—regional economic and territorial production complexes, which include enterprises and organizations of various spheres of the national economy, the combination and interconnected development of which within the boundaries of a specific region meet the interests of the assurance of its comprehensiveness and the increase of the efficiency of social production, as the form of the organization of management is characteristic of regions being newly development and is used mainly at the stage of designing and construction;

—territorial intersectorial associations that include enterprises, which belong to different spheres of social production, which are located within the boundaries of a specific administration formation;

—interbranch complexes, which unite scientific research centers and enterprises of various sectors of industry for the solution of an important scientific and technical problem—interbranch scientific technical complexes.

In conformity with the listed objects of intersectorial management let us examine in greater detail how the new organizational forms of management are being introduced in the practice of socialist management.

Territorial Intersectorial Associations as New Forms of Management

Interesting experience in intersectorial management was gained in the Georgian SSR during the conducting of an economic experiment which was aimed at the increase of the role of local soviets. Having been started in 1981 in Poti, this experiment then was also extended to other cities and rayons of the republic. In particular, the conditions of the experiment, true, in slightly modified form, were tested at the level of several rayons of Tbilisi, as well as large and medium-sized cities of the republic (Kutaisi, Sukhumi, Batumi, and Rustavi).

The results of the experiment, which was being conducted in Poti, were examined and approved in December 1983 in a decree of the CPSU Central Committee on the work of the Georgian CP Central Committee on the improvement of the level of economic work and the efficient use of resources, then other measures on the further development of the experiment on the increase of the role of local soviets of people's deputies in the economic and cultural construction of the city were also elaborated. In conformity with this decree the conditions of the experiment were extended to a number of other regions of the country. Thus, similar mechanisms of management are being prepared in Moscow Oblast, Georgiyevsk (the RSFSR), Termez (the Uzbek SSR), and other regions.

The goal of the "Poti experiment" is the use of the reserves of the increase of production efficiency, which are connected with the improvement of its territorial organization, the optimization of territorial production relations between enterprises, which are located on the same territory, the comprehensive development of the economy, and the coordination of the efforts of sectorial and territorial organs in the planned expansion of the social and production infrastructure. Thus, the experiment was aimed at the elimination of the formed disproportions in the development of the city forming and city supply spheres and at the prevention of such disproportions.

We will examine first of all the elements of the new system of the management of the comprehensive development of the economy of the territory, which are directly connected with the theme of this work—the improvement of the organizational forms of intersectorial management, although these forms, of course, do not

exhaust the content of the entire mechanism of management. It must be stressed that the experiment was preceded by the careful study of the advanced know-how, which had been gained in our country and in other socialist countries, particularly the experience of the GDR in the organization of the activity of territorially managed combines, of which the assurance of the optimality of territorial development is a function. And the decree of the Georgian CP Central Committee and the Georgian SSR Council of Ministers on the conducting in Poti of an experiment on the further improvement of territorial planning and the increase of the efficiency of the management of the economic and social development of the city was adopted only after the analysis of this experience.

In conformity with this decree it was envisaged to change the organizational structure of the management of the economy of the city and to bring it in line with the real needs of the development of municipal services. At the first stage a department of the coordination and management of economic and cultural construction was established in the structure of the city soviet executive committee by means of the permanent staff and the allocations, which had been earmarked for these purposes by enterprises of the city. All with this the city planning commission was strengthened.

The determination of the basic trends in the development of the economy of the city, the evaluation of its production potential, and steps on the assurance of the conformity of the social infrastructure to the production sphere are the main task of this department. In accordance with the results of this work measures aimed at the assurance of the balanced development of municipal services were specified. Among them one of the most important ones is the possibility of improving the territorial concentration of intersectorial works and the organization of the production cooperation of various enterprises in the interests of the improvement of the use of equipment, the increase of the level of its utilization, the increase of labor productivity, and the decrease of the expenditures on production.

For the practical implementation of the supervision of this work, as well as for the accomplishment of other tasks of the experiment the Poti Territorial Intersectorial Association (TMO) of the city executive committee of the soviet of people's deputies was formed. The basic functions of the association are: the planning of the comprehensive economic and social development of the city; the management of the complex of cost accounting enterprises and organizations of different departmental subordination, which are located on the territory of the city.

In its work the association is directly subordinate to the Georgian SSR State Planning Committee and the city soviet executive committee. The council of managers of the enterprises and organizations, which are a part of the association, is the highest organ of management of the association. In addition to them executives of the city functional organs (the city financial department, the departments of the State Bank and the All-Union Bank for Financing Capital Investments, the city statistical administration), as well as representatives of public organizations are members of the council. The council at its meetings considers and makes decisions on the most important directions of the activity of the association. The chief of the association is the first deputy chairman of the city executive committee of the soviet of people's deputies and chairman of the planning commission.

The last circumstance requires explanation. After the establishment of the territorial intersectorial association for the improvement of the coordination of the management of the economy, the assurance of the unified planning of economic and social development, and the elimination of the duplication of management functions in the work of the association and the planning commission the decision was made to include the latter in the association, having made its manager the chairman of the planning commission and having assigned to the association functions on the planning of the development of the city.

The council of managers of the enterprises and organizations of the territorial intersectorial association as the highest organ of management is not an analog of the regional council of directors of enterprises. This is a permanent working organ of management, which performs the functions of a regional coordinator in the development of municipal services and ensures favorable economic conditions and prerequisites of the efficient work of the enterprises and organizations, which are located on its territory. At its meetings, which are held quarterly, the council of the association considers a wide range of questions, which are connected with the activity of the council itself and with the coordination of the work of the enterprises subordinate to it. It organizes and monitors the concentration of resources through proportionate participation in citywide measures, examines the drafts of plans of the economic and social development of the city, and specifies steps on the increase of labor productivity, the decrease of the materials-output ratio of production, and the output of consumer goods. Thus, the territorial intersectorial association acts as an organizational economic and production complex of the enterprises and organizations, which are located on a specific territory.

More than 50 enterprises and organizations of various sectors of industry, transportation, communications, and the social infrastructure are a part of it. Here all the enterprises and organizations, which are a part of the association, retain economic independence, the rights of a legal entity, and departmental affiliation.

None of "its own" indicators are established for the territorial intersectorial association. Its activity as a whole is evaluated according to the sum of the results of the work of the enterprises that are a part of it. The task

of the association consists, consequently, not in changing or blocking the system of the sectorial management of the enterprises of the city, but in coordinating their activity.

The functional structure of the the territorial intersectorial association envisages the intersectorial division of labor and the cooperation of operations for the achievement of the highest level of development of municipal services. The territorial intersectorial association has the greatest influence on enterprises of local industry. This is explained first of all by the fact that such enterprises organizationally are subordinate directly and completely to the territorial intersectorial association. Moreover, the deductions from the profit of enterprises of local industry act as a portion of the revenues of local budgets, that is, the executive committees of the local soviets are economically interested in high results of the activity of enterprises of local industry. Thus, in 1986 the output of products made from local raw materials and production waste products by the city industrial combine increased as compared with 1985 by 1.5-fold, which affected the financial results of the activity of the territorial intersectorial association.

And still it is important to stress that the establishment of the territorial intersectorial association does not change the sectorial affiliation of the enterprises that are a part of it. This applies even to the works that are established at the expense of the territorial intersectorial association. For example, during the experiment in 1983 a combine for the production of tea concentrates and refreshing beverages—the first enterprise of this sort, which is directly subordinate to the territorial intersectorial association—was opened at the expense of the financial resources of the association. However, practical experience showed that the fulfillment by the combine of the functions of the superior sectorial organ (the planning of the activity of the combine, the organization of its material and technical supply and capital construction, the assurance of technical development, the pursuit of personnel policy) is inadvisable, and that is why the combine was made dually subordinate—to the territorial intersectorial association and the Georgian SSR State Committee of the Tea Industry.

But the territorial intersectorial association can manage more successfully the enterprises, which produce products of intersectorial use and form the production infrastructure. Among such enterprises are the Poti administration of electric facilities, the city communications center, the motor transport association, and the administration of water and sewer services, on the normal operation of such the activity of all the enterprises of the city, as well as the living conditions of the population depend.

At the same time, as the data of the experiment show, the territorial intersectorial association also had a positive influence on the work of enterprises of union and union republic subordination, which are located on the territory of the city. In particular, the Potielektroapparat Plant of the USSR Ministry of the Electrical Equipment Industry was supplied significantly better than before with railroad containers for the shipment of finished products and with materials handling equipment. Cooperation with the territorial intersectorial association enabled the enterprise to overcome interdepartmental barriers more rapidly when being supplied with raw materials and products through the system of territorial organs of material and technical supply. Questions of fuel, electric power, and water supply were settled significantly more efficiently.

The new organizational form of intersectorial management made it possible to increase appreciably the quality of the territorial management of the enterprises of the city. At the meetings of the territorial intersectorial association the financial status of enterprises is analyzed critically, specific means of eliminating the shortcomings in their work are elaborated, and the monitoring of the fulfillment of the made decisions is set up. All this makes it possible to influence efficiently the solution of problems, which arise at various enterprises, to attract in necessary instances additional resources, to decrease the cost of the output being produced, and to increase the profit.

A city commission for the policy of economy and the efficient use of material resources was established for the purposes of the efficient use of material, fuel, and energy resources and the dissemination of advanced know-how. Here the analysis of the means of saving both primary and secondary resources is included in its work. Base enterprises, which are responsible for the elaboration of the corresponding measures, were singled out in each of the specific directions of the decrease of the materials-output ratio of production. Limits of material expenditures per ruble of commodity production were established with allowance made for the intersectorial experience of introducing new technologies.

The socialist obligations, which are assumed by labor collectives, as a rule, envisage the exceeding of the assignments on the saving of material resources by 5-9 percent. For the saving of electric power an operations groups for the observance of the limits was established, spot checks on the saving of resources at enterprises are organized.

For the commitment of secondary resources to the economic turnover their certification is carried out annually. A catalog of secondary resources that have not been committed to production, in which the dimensions of the waste products, the material, their amounts, and suggestions on use are indicated, is compiled on its basis. For example, in 1985 alone the production of items from production waste with a total value of more than 500,000 rubles was assimilated.

The territorial intersectorial association establishes for the enterprises subordinate to it assignments on the gathering of secondary resources. For this the network of receiving centers has been expanded, schedules of the removal of secondary raw materials from all enterprises of the city have been drawn up, and so on. As a result of the use of waste products it is possible to decrease appreciably the consumption of other material resources.

Much attention in the activity of the territorial intersectorial association is being devoted to questions of the commitment of idle manpower resources to social production. For these purposes a kind of data bank on vacancies, which are available at enterprises and organizations of the city, was formed. These data are grouped by occupations with the distinction of the conditions of work (shift, seasonal, part-time, a shortened week, a sliding schedule, the possibility of work at home). A list of positions of the association was also drawn up. As a result the management of the territorial intersectorial association has information on the availability of manpower resources, envisages possibilities of the job placement of graduates of secondary schools, soldiers, who have been demobilized from the ranks of the Soviet Army, and retirees, who want to work, as well as has data on all the managers and specialists of various sectors of the national economy. All this makes it possible in a more skillful manner to implement personnel policy and to involve the unemployed in social production. The information on differentiated working conditions helped to place in jobs in 1984 alone about 2,450 people, as a result of which the number of people employed in the city increased by nearly 10 percent.

The steps on the job placement of the unemployed and the improvement of the use of manpower resources are being fundamentally supplemented by the certification and rationalization of workplaces. Already at the start of the certification excess equipment worth 600,000 rubles was identified. Here 70 workplaces were eliminated.

The impact, which is obtained in case of the rationalization of workplaces, is twofold. It makes it possible to identify, first, all the excess or unutilized equipment at industrial enterprises and, second, the workplaces, at which in accordance with the conditions of the production process the labor of women, retirees, or the disabled can be used with differentiated working conditions.

The possibilities of an effect of regional management on scientific and technical progress are more limited than in the structure of sectorial management. They are confined mainly to the dissemination of scientific and technical information, the monitoring of the fulfillment of the plans of new equipment, the organization of introducing brigades, and so on. The functions of the territorial intersectorial association consist here in the organization of a brigade in accordance with the order of an enterprise and in its provision with materials and the possibility of the fulfillment at other enterprises of the city of production assignments, for example, the production of a prototype of an item. A portion of the payment for the completion of a development is transferred to the technical development fund of the association, which is used in the interests of the technical improvement of the production base of enterprises of the city.

In case of the carrying out of more complex technical developments the territorial intersectorial association can cooperate with various scientific research and planning organizations of other regions of the country. Thus, planning estimates for the construction of a modern plant of machine tool attachments, which is being carried out by the cooperation of the assets of the territorial intersectorial association and enterprises of the city, were drawn up on the basis of a contract with Ukrgiproelektro. For the more complete use of local raw material resources a contract was concluded with the corresponding scientific research institute of Leningrad for the development of a technology of the production of autoclave cellular concrete from local raw materials. A contract was concluded with the State Institute for the Planning of Enterprises of the Timber and Wood Processing Industry for the performance of work on waste-free wood processing on the basis of the resources of forestry and interested enterprises of the city, which have scrap wood. An automated control system of the economy of the city (the Poti ASU) is being developed.

The management of the social infrastructure of the city: housing construction, the organization of the operation of passenger transport and the entire sociocultural complex, is in the sphere of the functions of management of the territorial intersectorial association. This is being achieved first of all by means of the establishment of regional economic stimulation funds and the increase of the role of economic methods of management and by the improvement of comprehensive socioeconomic planning.

As to the implementation of the Food Program, here the development of subsidiary farms of enterprises and organizations of the city and private plots is being practiced extensively. The impact of this work is very significant. The determination of the specialization of subsidiary enterprises and the allocation of lands for the expansion of the fodder base made it possible to successfully fulfill the assignments which were envisaged by the food program of the city. As a result meat production increased during the years of the 11th Five-Year Plan by fivefold and vegetable production increased by 2.5-fold. The number of subsidiary agricultural enterprises increased during the years of the five-year plan from 11 to 21. Here during the last years of the past five-year plan agricultural products worth 250,000-300,000 rubles were sold to the population through specialized stores.

The conditions of the experiment envisaged the planning of the amounts of material and technical resources, which were allocated to Poti. This step made it possible to shift the obtained resources in a flexible manner and

in the end to decrease the amount of working capital. It was also supplemented by the taking of an inventory of the physical assets, which were available, but were not being used by enterprises. A catalog of excess and nondisposable materials was compiled, which made it possible to decrease appreciably the above-standard stocks.

The territorial coordination of supply and marketing activity improved the material and technical supply of enterprises and organizations of the city with petroleum products, spare parts, machines, and equipment. In the structure of the plan of the socioeconomic development of the city the central place is assigned, as was already noted, to the territorial concentration of production and the efficient use of local resources of production.

The efficiency of the functioning of municipal services is completely ensured only when the efforts of territorial organs of management are aimed at the development of the production infrastructure and intersectorial works. The following steps were taken in Poti specifically in this direction:

—the production of machine tool attachments for the needs of enterprises of the city was centralized, the construction of an intersectorial plant of machine tool attachments on the basis of proportionate participation was begun;

—a centralized foundry was established for city enterprises for the purpose of decreasing the transportation expenditures on the delivery of castings to consumers;

—unutilized technological equipment, especially single-design equipment, which is available at individual enterprises, is being used collectively;

—cooperation in the use of production waste, which forms in the city, and local raw materials was ensured.

The consideration of the internal reserves of the increase of production efficiency makes it possible to adopt more sound plans of the development of enterprises. Thus, initially it was envisaged by the plans of the increase of production for the 11th Five-Year Plan to increase the volume of industrial production by 9 percent. The revised planning level of this indicator came to 33 percent. During the 12th Five-Year Plan the volume of industrial production has to be increased by not less than 1.3-fold, the output of consumer goods—by twofold, the sales volume of consumer services—1.5-fold, and the retail commodity turnover—1.3-fold.

The fact that capital investments, material and technical resources, and all the limits for designing and construction are being allocated directly to the city soviet executive committee, is also new in the system of the planning of the socioeconomic development of Poti during the 12th Five-Year Plan, while this is making it possible to ensure the comprehensiveness of the development of the economy of the city.

In addition to the organizational structure of intersectorial management and the changes in the system of planning, the increase of the role of economic methods in territorial management and the use of economic stimuli and levers: cost accounting, the profit, the bonus, were an essential element of the Poti experiment. The formation and development of the system of economic interest and responsibility of the local soviets in the end results of the work of the enterprises and organizations, which are located on the territory of the city, regardless of their departmental affiliation were the main tasks here.

Regional centralized economic stimulation funds: the production development fund, the material incentive fund, the fund for sociocultural measures and housing construction, form the basis of the economic methods, on the basis of which the territorial intersectorial association operates.

These funds are formed by the centralization of similar funds of enterprises and deductions from their profit, which was derived as a result of the activity of the territorial intersectorial association. They, in conformity with their purpose, are used for the goals of technical development (the establishment of a tea combine, proportionate participation in the building of a brick plant, the purchase of equipment for enterprises of the territorial intersectorial association, the expansion of the base of material and technical supply) and the material stimulation of the workers of the management staff and the enterprises for the achieved results in socialist competition, as well as for the implementation of sociocultural measures or the expansion of their base (the renovation of movie theaters, the repair of public dining enterprises, the establishment of an illuminated newspaper, the purchase of equipment for organizations of the nonproduction sphere, the financing of operations on contracts with scientific research institutes and planning organizations, which are performed in the interests of the entire city).

Moreover, for the increase of the interest of the city soviet of people's deputies in the results of the activity of enterprises and organizations of superior subordination a procedure, in case of which assets in the amount of 10 percent of the planned net balance and 50 percent of the above-plan net balance of the profit, which is derived by enterprises and economic organizations of republic and union republic ministries, which are located in the city, are transferred to the local budget, was introduced.

A portion of the additional profit, which was derived from the sale of new, highly efficient products with the State Emblem of Quality in the amount of 10 percent of the sum of the incentive markups, which is liable to payment to the budget, and 50 percent of the charged fee

for water, which is taken in by enterprises from the water management system of the city, is also transferred to the local budgets. At the end of the last five-year plan about 1 million rubles had been transferred through the named channels into the budget of the city.

The new system of deductions of assets for local budgets, which is being introduced in conformity with the decree of the USSR Council of Ministers of 3 August 1984, will contribute to the further increase of the revenue portion of the budget. In all 10 percent of the profit of industrial enterprises of union subordination, as well as a portion of the turnover tax, which is levied on the products of the city industrial combine and consumer service organizations, will be deducted for local budgets.

Under the conditions of the Poti experiment the system of lending was changed. The USSR State Bank granted the the territorial intersectorial association jointly with the city office of the State Bank the right to shift short-term credits. Within the city a balance of the income and expenditures of the population is being drawn up for the improvement of the quality of the planning of the volume of the commodity turnover and paid services to the population.

Let us cite several results of the experiment, which characterize the dynamics of the basic indicators of the development of the economy of the city during 1981-1985:

—the increase of industrial output came to 42 percent; the increase of labor productivity came to 40.4 percent;

—the sales volume of products with allowance made for contractual obligations on deliveries increased from 93.2 percent to 99.8 percent;

—the production of nonfood consumer goods increased by 1.8-fold;

—the production of products made from local raw materials and production waste increased by tenfold;

—the average monthly wage of industrial personnel of the city, who are engaged directly in production, increased by 15.7 percent;

—the growth of the payments to the state budget increased by twofold, including to the union budget by 2.3-fold.

These data testify to the significant advantages of the new organizational structure of intersectorial management. A very important thing in the evaluation of the results of the experiment, which was begun in Poti, is its close connection with the steps being implemented on the improvement of the activity of local authorities in the management of the socioeconomic development of regions. This circumstance was stressed in the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000: "To improve the activity...of the executive committees of the local soviets of people's deputies, to increase their role in the assurance of the comprehensive development of the economy on the subordinate territory, the efficient use of manpower, raw material, fuel, and energy resources, the cooperation of production, environmental protection, and the increase of the efficiency of the economy." The decree of the CPSU Central Committee, the Presidium of the USSR Supreme Soviet, and the USSR Council of Ministers "On Measures on the Further Enhancement of the Role and the Increase of the Responsibility of the Soviets of People's Deputies for the Acceleration of Socioeconomic Development in Light of the Decisions of the 27th CPSU Congress" is affording great opportunities on this level.

The specific directions of the work on the improvement of the activity of the local soviets, as is indicated in the decree, are the following:

—the increase of their role in the comprehensive development of the economy and the sociocultural sphere on the subordinate territory;

—the broadening of the rights of local soviet organs in the development of consumer goods, the sphere of services, intersectorial works, capital construction, nature conservation activity, and the social and production infrastructure;

—the increase of the responsibility of the soviets for the meeting of the needs of the population on the subordinate territory for foodstuffs and industrial goods, housing, and sociocultural and personal services;

—the improvement of the interaction of the soviets with the associations, enterprises, and organizations, which are located on the corresponding territory, the increase of their mutual interest in the improvement of the results of management;

—the extension of democratic principles in the activity of the soviets, the reinforcement of their staff with skilled personnel.

As we see, the idea of the experiment fully corresponds to the main content of the work, which is being performed in connection with the implementation of the decisions of the 27th CPSU Congress on the assurance of the unity of the sectorial and territorial development of the national economy, while the very course and results of the experiment were taken into account when developing further means of improving territorial management.

What new functions is the territorial intersectorial association of the Executive Committee of the City Soviet of Poti performing, which under the old conditions either were not in its competence at all or were taken into account in very reduced form:

—the day-to-day supervision of the activity of industry, transportation, and communications in the area, which corresponds to the tasks and functions of the territorial intersectorial association;

—the coordination of the work of enterprises of the production and engineering infrastructure (freight motor transport, rail transport, electric power and water supply);

—territorial production cooperation in the output of items of intersectorial use;

—the supervision of the formulation and implementation of the food program of the city;

—the organization and planning of material and technical supply in the area specified by superior organs, particularly the planning for the city of material and technical resources by a separate line;

—the conducting of concrete sociological studies, the analysis and the elaboration of recommendations in accordance with their results.

Along with this such functions of management as the improvement of the planning of the economic and social development of local industry on the basis of local raw material resources; the increase of the output and the enlargement of the assortment of consumer goods at enterprises of the city; the efficient use of material, fuel, and energy resources were given concrete expression.

All this makes it possible to rate the conditions of the experiment as an advanced form of the organization of intersectorial management.

The Intersectorial Management of Interconnected Sectors

The most important specific feature of the intersectorial management of similar sectors is the national economic level of such management. Precisely on this condition it is possible to make decisions, which ensure the obtaining of the greatest economic impact that is achievable as a result of the clear specification of priorities in interchangeable types of products. This is traced especially clearly from the example of the fuel and power complex of the country, the sectors of which cannot be developed autonomously. The specific nature of their interaction is determined by the objective necessity of their integration and by the expansion and extension of the production relations between them.

The concept of the preferential development of the petroleum and gas industry, which was formulated in the second half of the 1950's, was oriented toward the substantial improvement of the structure of the fuel and power balance of the country by the rapid increase of the production of the most advanced and efficient types of fuel—petroleum and gas, as well as the construction of thermal electric power plants. And this concept was consistently implemented, although important changes were made in it.

Thus, in recent years the construction of nuclear electric power plants, which makes it possible to increase appreciably the share of power being generated in the total volume of its production, has been acquiring greater and greater importance. By 1986 this indicator exceeded 10 percent. Here the total generation of nuclear electric power increased from 73 billion kilowatt-hours in 1980 to 167 billion kilowatt-hours in 1985. During all the years the production of gas, which came by the beginning of the 12th Five-Year Plan to nearly 650 billion cubic meter, gradually increased. Its share in the total production of fuel reached 35.5 percent. The dynamics of the production of petroleum (including gas condensate) was more complicated. Its maximum proportion in the total production of fuel fell to 1975-1980 (44.7-45.5 percent). During the 11th Five-Year Plan the total production volume of petroleum with gas condensate decreased from 609 billion tons to 595 billion tons, while the share in the total production of fuel declined to 39.5 percent.

The intersectorial management of the fuel and power complex of the country made it possible to completely meet the needs of the national economy for fuel and power. The most acute world energy crisis of the 1970's bypassed the country. In determining the prospects of development of the fuel and power complex, as a rule, it was possible to choose the most effective directions of the use of capital the investments that were allocated for the development of the complex; its structure was formed with allowance made for the achievements of maximum efficiency during each period of time.

The formulation of the long-term Energy Program—an important planning and management document, which contains a description and the volumes of the natural reserves of fuel and the value of the adjusted expenditures with respect to each of its types with allowance made for scientific and technical progress and territorial changes in production—was the result of the planned intersectorial management of the fuel and power complex. In conformity with the Energy Program long-range plans of the development of the fuel and power complex for the period to 1990 are also being drafted.

It is proposed to increase the production of petroleum and gas condensate to 635 million tons. Here the depth of refining of petroleum will increase from 58 to 65 percent. This important step, which determines the quality of the functioning of the entire fuel and power complex, is being supported by the fact that during the current five-year plan 1.5-fold more capital investments are being channeled into the petroleum refining industry than into petroleum production.

The production of gas will increase to 850 billion cubic meters, which will provide the bulk of the increase of fuel production in the country. The production of coal will increase (by approximately 70 million tons). Here it is necessary to bear in mind that the importance of coal as a strategic reserve of the growth of the fuel and power complex has been increasing in recent times. Its share in the world fuel reserves exceeds by nearly threefold the total share of petroleum, natural gas, and condensate. The share of nuclear electric power plants in the total volume of the generation of electric power will come in 1990 to 20 percent.

I would also like to direct attention to such an effect of the intersectorial management of the fuel and power complex as the program of the saving of fuel and power in the sectors which consume these types of resources. The development and introduction of energy-saving equipment and technology in the sectors of the machine building complex, undoubtedly, will decrease the load on the fuel and power complex, which is one of the most capital-intensive industries. As is noted in the Basic Directions of USSR Economic and Social Development for 1986-1990 and the period to 2000, the development of the fuel and power complex needs "to be subordinated to the task of the stable meeting of the needs of the country for all types of fuel and power by the increase of their production and generation with the systematic pursuit in all sectors and spheres of the national economy of a purposeful energy-saving policy."[7]

In the structure of industrial production and the national economy of the country as a whole the sectors of machine building and metal working, which by now have been formed into the powerful machine building complex, are playing a special role. The specific nature of the complex is determined first of all by the fact that precisely its sectors form the material basis of the retooling of the national economy and the structural reform of the economy, which is being carried out. The accomplishment of the most important tasks of the development of the Soviet economy during the final years of the 12th Five-Year Plan: the radical increase of labor productivity, the decrease of the materials-output and power-output ratios of production, the changeover to resource-saving technology, the acceleration of scientific and technical progress, and the increase of product quality, depends on the quantitative increase of the potential of machine building and—what is the main thing—its qualitative improvement.

Meanwhile the pace of development of the machine building complex in recent years has not conformed to the tasks of economic growth and has not ensured the changeover of the economy to the intensive means of development. Obviously inadequate capital investments have also been allocated for this. For example, during the 11th Five-Year Plan there were allocated for the development of chemical and petroleum machine building only a little more than 2 percent of the assets which were channeled into the sectors, for which it produces mechanism and machines. This led to the aging of the pool of equipment and to the sharp lag of the technical level of the machines being produced behind the level already achieved in developed countries. In heavy machine building, for example, nearly half of the basic types of items do not conform to the present technical level. And the very technical base of machine building itself does not conform to the tasks of the national economy, since it does not make it possible to organize the production of advanced, highly productive equipment.

Therefore, in order to ensure the retooling of the national economy and advanced changes in its structure, machine building itself should be retooled. For the substantial acceleration of its development already during 1986-1990 it is proposed to increase the capital investments by 1.8-fold as compared with the 11th Five-Year Plan. The production of highly productive equipment and the supply with electronic devices will increase sharply. In the total volume of output of machine building the proportion of equipment, which is being assimilated and produced for the first time, will increase from 27 to 52 percent. This will make it possible to increase by approximately twofold the level of production automation and to increase by 2- to 2.3-fold the volume of production of computer hardware.

The use of advanced base technologies will be expanded by 1990 by 1.5- to 2-fold, while the use of special technological equipment for machine building's own needs will be expanded by fourfold.

The task of shortening to one-fourth to one-third the time of the development and assimilation of new equipment has been posed for enterprises which produce machine tools and machines. Its models, which are being newly developed, should in productivity and reliability surpass by not less than 1.5- to 2-fold the analogous product that is being produced. Here the output of advanced equipment will increase sharply: the production of NC machine tools will increase by twofold, while the production of machining centers will increase by fivefold, which will make it possible to meet completely the need of the national economy for them. The production of flexible modules will increase by 2.3-fold, flexible production systems—by 5.3-fold, and automatic and semi-automatic machine tool lines—by 43 percent. The output of modern tools for such equipment will also increase accordingly. Thus, the reform of the structure of production is being carried out in a technologically advanced form.

The achievement of the planned levels of development of the machine building complex by 1990 and 2000 requires the improvement of its management. As an object of intersectorial management machine building is one of the most complex integrated sectors of the national economy. It is included in the structure of industry, but machine building enterprises, shops, and

sections operate not only within industrial production. Organizationally the management of machine building is broken up among three spheres.

The first of them includes enterprises of specialized sectors which are united in machine building ministries. The second sphere includes machine building plants of nonmachine building ministries, and machine, repair, and construction shops and works of nonmachine building enterprises are included in the third. The limited nature of the cooperative relations of sectorial ministries is leading to the establishment of an intersectorial repair works in practically every not only nonmachine building, but also nonindustrial ministry.

According to the data of the USSR Central Statistical Administration, out of every 100 machine building enterprises 71 plants produce casting for their own needs, 84 plants—forged pieces, 76 plants—stampings, 93 plants—gears, 61 plants—hardware. Practically all of them produce tools and machine tool attachments. But the departmental approach to the formation of cooperative relations on deliveries of items of intersectorial use has the result that the construction of new works and the modernization of operating works envisage the availability of shops for the output of these products, that is, for the universalization of enterprises. Thus, the established organizational forms of the management of intersectorial works do not conform to the achieved level of their specialization.

The development of the machine building complex is taking place under special conditions. In contrast to the fuel and power sectors, which are characterized by the similarity and certain interchangeability of the output being produced, the items of machine building are being differentiated more and more with respect to their functional purpose: the range of similar machines is expanding sharply, units, which were not produced previously, are appearing, and so on. All this is leading to the appearance in the structure of machine building and metal working of new sectors and subsectors and, it would seem, is objectively complicating the organization of the unified intersectorial management of them.

However, this is not happening, inasmuch as the changeover from the establishment of new machine building enterprises on the basis of finished product manufacturing specialization to the formation of works, which are based on part, technological, and functional specialization and are called upon to serve the needs of all machine building ministries of the given region, has been clearly specified here. The further sector-by-sector differentiation of machine building and the appearance in its structure of sectors, which produce equipment that is fundamentally new in its functions, are accompanied by the necessity of their greater and greater cooperation with enterprises which functionally specialize in the performance of specific jobs.

The specific nature of the location of such works is due to the fact that with the broadening of the sectorial framework of cooperation the intensity of intersectorial relations within a specific region weakens, while this also cause the decrease of the indicators of the economic efficiency of production. However, the increase of the quality of the management of production development requires the elimination of the organizational self-sufficiency of sectorial management and the practical implementation of the reserves of the increase of labor productivity, which are included in the formation of efficient relations through cooperation.

The objective necessity of the unified management of the machine building complex of the country is also dictated by the standardization of the technology of producing various types of items. This finds expression in the extensive possibilities of the use of flexible production systems in the output of machine building products of the most different sectors. Flexible production and automated systems make it possible to avoid the strict technological specialization of equipment, which earlier was characteristic of machine building.

At the same time the uniformity of technology on the basis of flexible systems makes it incumbent to approach in a new way the system of personnel training. While making greater demands on the training of both workers and engineering and technical personnel, the extensive introduction of flexible systems makes it possible to concentrate this training on an intersectorial scale, for the most different sectors of machine building. As a result, in addition to the technological similarity of machine building sectors another factor, which is conducive to the intersectorial management of this complex, emerges.

The standardization of production is the next factor, which determines the possibility and necessity of the coordinated management of the development of the sectors of the machine building complex. Here it is a question not of the standardization of the assortment of the output being produced (this is a task of sectorial management), but of the standardization of items of general machine building use and of parts and assemblies, on the basis of which the products of various sectors (hydraulics, pneumatic systems, and so on) are produced.

There appears as a characteristic feature of the formation of the machine building complex as an object of intersectorial management the fact that it is such only at the statewide level. It would be incorrect to seek an analogy between the machine building complex and, let us assume, the agroindustrial complex, the management of which is organized according to the territorial production criterion. Unified territorial industrial associations are advisable only at intersectorial works. Their task is to meet the needs of all enterprises which are located on the given territory, regardless of their departmental subordination, with items of intersectorial (general machine

building) use. All other production associations of machine building ministries are an object of sectorial management, in which several important problems, which were spoken about above, are solved.

The formation of the Bureau of the USSR Council of Ministers for Machine Building was an important practical step, which was aimed at the development of the organizational structure of the intersectorial management of the machine building complex. The bureau supervises the development of the complex as a whole, forming an advanced structure of the block of machine building ministries and implementing the unified state science and technology policy in this most important sector of the national economy. It should be particularly noted that the Bureau for Machine Building has the opportunity in the interests of the acceleration of the retooling of the national economy to adopt operational orders which are connected with the introduction of new equipment; it examines the drafts of five-year plans and redistributes the material and other resources, which are necessary for the accomplishment of the posed tasks. The establishment of a new organizational structure of the management of the machine building complex is called upon to promote its transformation into the base of technical progress.

Such a structure of management may prove to be effective in the organization of the management of sectorial, as well as technological and functionally specialized works. Although during the 11th Five-Year Plan the USSR State Planning Committee allocated to all machine building ministries capital investments and limits of construction and installation work for the building of enterprises for the output of products for intersectorial purposes, no steps were taken on the organization of intersectorial interaction. It was not set up between both machine building and nonmachine building ministries.

Therefore, the task of the Bureau for Machine Building is the meeting of the needs of the national economy for items of intersectorial use. Comprehensive goal programs of the development of intersectorial works, in which the stage-by-stage elimination of obsolete shops and sections as new specialized capacities are created is envisaged, have been formulated for a number of cities and oblasts. The economic efficiency of specialized enterprises is very high: labor productivity increases by 2- to 2.5-fold, capital investments are reduced by 20-25 percent, and the production cost decreases to one-fifth to one-half as compared with the decentralized production of items of intersectorial use. Programs of this sort were formulated during the 11th Five-Year Plan for industry with allowance made for the optimum size of the capacities of intersectorial works, which ensure the use of new, more advanced, and highly productive equipment. However, it did not envisage the improvement of the very organization of management. The "optimum capacities" of intersectorial works may be combined with not the best use of their products by other sectors.

Therefore, the implementation of such a program requires removal from the sector of the works for the production of items of intersectorial use, the organizational support of their development, and the formation of large territorial industrial or territorial production (scientific production) associations, which are responsible for supplying these products to all the enterprises located on the given territory, regardless of their departmental affiliation. Industrial associations should be specialized in individual types of intersectorial works (founding, forging, compressor, tool, and so on).

Suggestions on the establishment of a union republic ministry of intersectorial works, which is responsible for the pursuit in this largest sector of a unified technical policy and the optimization of the territorial production relations between enterprises on the development of the cooperation of deliveries of items of intersectorial use, are now being drawn up. Here the possibilities of the organization of the two-level management system "ministry—territorial industrial association" in the structure of intersectorial works are most favorable. The establishment of an organ, which is responsible for the pursuit of a unified technical and economic policy in the sector and for the complete meeting of the needs of the national economy for the necessary products, will prevent the appearance of departmentalism and regionalism.

The improvement of the management of intersectorial works will make it possible to save 1.7 billion rubles on the decrease of the product cost and to eliminate 240,000 unnecessary workplaces. The implementation of the outlined program of the intensification of the intersectorial specialization and cooperation of production will make possible already in the next few years to triple the output of products of a general machine building type, while having freed in so doing 460,000 workers.

This is an appreciable impact, which is being substantially supplemented by the broadening of the range of the standardization of products and the intensification of production specialization. The increase of the share of components at enterprises, which produce a final product, and the changeover from general-purpose (automaking, tractor building, machine tool building) enterprises to assembly plants will be the result of this.

Another important direction in the activity of the Bureau for Machine Building is the efficient management of interrelations with CEMA member countries. Their share in the total world volume of production of machines and equipment came by the beginning of the 12th Five-Year Plan to 25 percent. In all 15,000 descriptions and items of machine building output were encompassed by contracts on cooperation in the production of machines and the specialization of individual countries in their output.

The horizons of the development of relations between the USSR and the CEMA member countries gave rise to a new property of them—the organization of joint enterprises. The first interdepartmental agreement in the

practice of cooperation between CEMA countries on the organization of a joint enterprise for the production of items of automotive electronics was signed in early 1986.

The Intersectorial Management of Scientific and Technical Progress

The 12th Five-Year Plan became an important stage of the introduction of new forms of the intersectorial management of scientific and technical progress. The introduction of one innovation or another in production and the mass dissemination and extensive use of it in all sectors are a number result of the commencing of basic and applied research and planning, design, and technological development.

However, this process is realized far from automatically. The organization of a new works not only involves the building of a new enterprise and is not limited just to the expenditures on it, but objectively leads to the formation of a most complicated network of production, technological, and economic relations of the enterprise at times with thousands of suppliers. The associated expenditures, which are connected with the corresponding development of related enterprises and plants, exceed by many fold the direct capital investments in new construction.

Under these conditions the coordinated development of the entire complex of enterprises, on which the formation of the new works depends, is a most important condition of the "survival" of a completed scientific and technical development and its practical implementation. The formation and development in the structure of social production of a new unit, which affects the economic interests of enterprises of the most different sectors, also require the appropriate organization of intersectorial management.

The objective prerequisites of the distinction of scientific and technical progress as an object of intersectorial management are also determined by the peculiarities of the present stage of development of the scientific and technical revolution. Having begun in the middle of the 1950's with the complete mechanization and automation of mechanical production processes, subsequently it encompassed objects of labor, making it possible by means of chemical technology to obtain raw materials and materials with preset parameters and properties. The appearance and extensive use in production management of computers, the use of new energy carriers, particularly the successes of atomic energy, and in recent year intensively developing biotechnology, genetic engineering, and the robotization of production have been making it possible to increase labor productivity by many fold, to ensure an enormous saving of resources, and to improve the quality of the output being produced. The uniqueness of the present stage of the scientific and technical revolution, which more and more often is being called the "technological" revolution, consists in the fact that the integration of the revolutionary changes of all the elements and components of "production": equipment, source raw materials, technology, the management of production in the broad sense of this word, including not only the optimum regulation and day-to-day monitoring of its course, but also designing and preparation, is occurring.

This interdependence of the different directions of scientific and technical progress, which just in the recent past were analyzed as autonomous, independent directions, has become so stable and strong that it should be regarded as its characteristic trait, its common law. Finally, the "all-permeating nature" of the scientific and technical revolution, an object of the "encroachment" by which not only industry, but also agriculture, transportation, and the nonproduction sphere as a whole became, is making the task of the efficient intersectorial management of scientific and technical development a problem that is of vitally great importance for the country. Its solution also requires the corresponding organizational structure.

However, scientific and technical progress, which is regarded first of all as a result of the production implementation of scientific and technical innovations, presumes not only the analysis of the changes, which the organization of a new works makes in the system of material balances. However important and difficult the task of the painless inclusion of one or a group of new enterprises in the structure of social production is, it does not yet exhaust the entire content of the work on the assurance of efficient scientific and technical development. The practical implementation of the achievements of scientific and technical progress requires the competent organization of scientific research within individual sectors of science and between them, as well as, what is extremely important, the assurance of the integration of the basic components of scientific and technical progress, which are regarded as the unified and individual "science—technology—production" process.

In time this process encompasses the following interrelations of the sphere: basic and applied research, technical (experimental design, technological, planning, organizational) development, pilot production, the primary technical and economic assimilation of innovations, their dissemination, the mass production of the innovation (current production), and its replacement with a more efficient innovation. And if the "matching up" of all the elements of the "science—technology" cycle, that is, the processes of the derivation of new knowledge on the basis of basic and applied research and the materialization of its results in highly efficient equipment and technology, which are needed by the national economy, as a whole is satisfactorily ensured, the "technology—production" unit, that is, the mass retooling of enterprises on a new technical base, is most reliable.

Of course, the assurance of the unity of basic and applied research is an object of special decisions on the development of science. The greater technological orientation in

the work of academic institutes is objectively due to the trends of the unification of basic research and applied development as common parts of the "research—production" process. The goal orientation of basic research toward practical needs makes it possible to shorten drastically the duration of this process. The introduction of innovations, which in practice unites science with production, remains under present conditions the weakest link.

This circumstance to a significant degree is due to the difference of the functions of science and production. Although they are included in the unified process of scientific and technical development and are united by common social goals, each of these elements of social production is relatively autonomous and performs its own specific functions. Science reveals what is new, while physical production embodies, materializes it in specific types of products. As a result science and physical production from the standpoint of management are oriented toward different planning horizons: the results, which are obtained by science today, can be used only in the future. Therefore, any attempt to establish a unified noncontradictory system of the management of "present-day science" and operating production, which is based on two different criteria of the evaluation of their end results, will be unsuccessful. Consequently, it should be a question not simply of the improvement of the two autonomous mechanisms, which operate in the "science—technology" and "production" sphere, but of a common economic mechanism, which ensures the generation of scientific and technical innovations and their immediate inclusion in production.

The conflict of the functions of science and production appears in the larger and larger gap between the time of the obsolescence of new equipment and the period of its possible physical operation. In instrument making, for example, the produced models of instruments and apparatus become obsolete every 5 years, although their wearing out begins on the average after 20 years. The obsolescence of scientific and technical developments in many rapidly developing sectors occurs even more rapidly: if a development has not been implemented within 1.5-2 years, it is, as a rule, already inadvisable to introduce it, since it does not meet the criteria of scientific novelty. Thus, the speeding up of basic research and scientific and technical development at the same time leads to the shortening of the periods of operation of new equipment, while in case of an insufficiently adjusted system of the transfer of developments to production new equipment becomes obsolete already before the start of its production.

From the standpoint of operating production the economic consequences, which are due to the specific nature of the functions of science and production and the economic inadvisability, as well as the impossibility of using any completed development, can be fully appreciated only when the losses, which are connected with the replacement of equipment in case of the change of the items being produced: the expenditures on new equipment and the direct losses from the elimination of old equipment, the sharp decrease for a specific period of the volumes of production, in accordance with which the activity of primary economic units is evaluated, are taken into account. The contradiction between the constant increase of the potential impact of new equipment and the possibility of obtaining it is explained precisely by this. The shortening of the period of the use of an item, which also requires the faster change of its production, signifies directly for enterprises only that the introduction of a new item often upsets the system of the stimulation of labor collectives in accordance with the results of operating production.

From the standpoint of the organization of the management of scientific and technical progress at least three essential circumstances follow from this. First, the necessity of the increase of the quality of scientific and technical developments and the implementation in them of fundamentally new ideas, which increase labor productivity by several fold, which makes it possible to lengthen the obsolescence period. Second, the necessity of strengthening the technological orientation of basic research. Third, the necessity of the intersectorial organizational and economic support of the speeding up to the transfer of scientific research developments to production. Here an economic mechanism, which stimulates the changeover to the output of new items, is of particular importance, although its development outside specific organizational forms, of course, is impossible.

Let us examine in this connection the organizational forms of the management of scientific and technical progress, which have formed in USSR industry. Until recent times the establishment of production and first of all scientific production associations has played an important role in the management of the processes of the introduction of scientific developments in production. Their number increased from 608 in 1970 to 4,300 in 1985, that is, it came to nearly 10 percent of the number of all enterprises and associations, which are carried on an independent balance sheet. The share of scientific production associations and production associations in the total volume of sold output came to 50 percent. However, the number of scientific production associations—the most successful form of the combination of science with production—during the 11th Five-Year Plan did not exceed 360. Meanwhile, as conducted studies show, the duration of the "research—production" process is shortened at scientific production associations to one-half to two-thirds.

With respect to composition they include: a sectorial scientific research institute, a series-producing plant, a design bureau, a pilot experimental plant, a start-up and adjustment organization, a center for the training of personnel, a center for the scientific and technical service of enterprises and organizations of this subsector, patent information, standard research, copying and

duplicating, and other subdivisions. In contrast to production associations, of which the assurance of the large-series or mass production of products is the task, as a rule, only one enterprise is included in a scientific production association.

The scientific production association simultaneously performs the functions of the organ of economic management of the subdivisions that are a part of it; the immediate organizer of scientific research, planning and design development, the assimilation and introduction of new types of products in production; the organ of the coordination of scientific research work in the subsector. The establishment of scientific production associations contributed to the improvement of scientific and technical development in industry, while the assurance of the organizational unity of the enterprises and organizations, which are a part of it, does not yet make it possible to reconstruct their economic unity. The emergence for enterprises of the cost accounting unprofitability of the changeover to the output of new equipment, which disturbs the established stimuli in accordance with the results of production activity, is also characteristic of scientific production associations, since the systems of evaluations of the work of the scientific research, design, and production spheres of the scientific production association remain autonomous and often economically at variance with each other.

The set of scientific and technical comprehensive goal programs, which was formulated in the second half of the 1970's, conformed to the goals of the creation of more favorable conditions of the introduction of scientific developments in production. They confirmed their effectiveness, especially in those instances when the implementation of the program did not affect intersectorial interactions, but blended with the organizational framework of a separate sector.

In the USSR experience also exists in the elaboration of important intersectorial problems, for the solution of which powerful organizations, which contain, in addition to applied scientific research institutes and design and planning bureaus, an academic institute and large pilot and experimental works (the programs of the launching of the first artificial earth satellite in the world, the construction of nuclear electric power plants, and others), were formed.

During the 12th Five-Year Plan the group of such organizations is being expanded substantially. The advisability of this decision is determined by the experience, which has been gained within the USSR Academy of Sciences, of establishing integrated interbranch scientific and technical centers, which coordinate the conducting of basic research and specific developments, as well as the practical implementation of their results. At present it is being proposed to disseminate as extensively as possible the experience of organizing such centers, which are formed on the basis of an academic institute, since it has proven to be very effective. In particular, the system of the organization of scientific research and the introduction of its results in production, which has been adopted at the Institute of Electric Welding imeni Ye.O. Paton, also testifies to this.

The value of this experience for use in the practice of the organization of the quickest introduction of the results of basic research is increasing substantially under present conditions, when the role of the USSR Academy of Sciences as the coordinator of scientific research work in the country has to be enhanced, its responsibility for the development of the theoretical principles of fundamentally new types of equipment and technology has to be increased, and a technological orientation has to be lent to a greater extent to the work of academic institutes.

In this connection the decree of the CPSU Central Committee and the USSR Council of Ministers on the establishment of interbranch scientific technical complexes (MNTK's) and steps on the support of their activity was adopted in late 1985. It is stipulated by the decree that scientific institutions, design and technological organizations, and pilot enterprises of various sectors will become a part of these complexes, which are being established in the main directions of scientific and technical progress. All the institutions and organizations of the complex will operate in accordance with a common plan, which is drafted by the main organization and is approved by the USSR State Committee for Science and Technology in consultation with the USSR State Planning Committee and the USSR Academy of Sciences. Such a procedure of the organization of work will make it possible to unite the efforts of various institutions and enterprises, to eliminate departmental isolation in the solution of the most important intersectorial scientific and technical problems, and to strengthen the contact of science with production.

The necessity of forming interbranch scientific technical complexes (MNTK's) stems from the fact that the implementation of a number of ideas of basic science and the development of its fundamentally new directions are leading to the appearance of such types of equipment, the production of which, as a rule, does not fit into the established system of sectorial management. All this is drastically complicating the turning out of prototypes of new types of equipment and the changeover to their mass production, which is leading to large losses in the national economy.

In early 1987, 20 such interbranch scientific technical complexes, including the above-named interbranch scientific technical complex based on the Institute of Electric Welding imeni Ye.O. Paton, which is developing technology and equipment for welding, facing, soldering, and the application of coatings, were already operating in the USSR. The Rotor Complex is called upon to ensure the changeover to the mass production of rotary and rotary conveyor lines, the use of which makes it possible to produce many types of machine building

products in automatic mode, to increase labor productivity by fourfold, and to reduce the production areas to one-half, which is of especially great importance for the retooling of enterprises in large cities. The Personalnyye EVM Interbranch Scientific Technical Complex is ensuring the accomplishment of the tasks, which are connected with the development and production during the 12th Five-Year Plan of microcomputers which satisfy the requirements of world standards. Such interbranch scientific technical complexes as the Svetovod Complex for the rapid development of fiber optics, the Biogen Complex for the solution of problems of biotechnology, the Nadezhnost mashin, Katalizator, and other complexes have now been established under the USSR Academy of Sciences.

The cited list of interbranch scientific technical complexes testifies to the wide range of problems which they are working on, but the main thing, which is typical of each of them, is the singling out of a priority direction in science, which promises the obtaining of a significant economic impact.

In the immediate future it is proposed to form a large number of other interbranch scientific technical complexes, moreover, on the basis of not only academic, but also large sectorial scientific research institutes, which are established scientific collectives that have within them developed pilot works. Thus, the main organization of the Robot Interbranch Scientific Technical Complex is the Experimental Scientific Research Institute of Metal-Cutting Machine Tools of the Ministry of the Machine Tool and Tool Building Industry. The task of the complex is the development of robots, systems of robots, as well as flexible machine systems, which are used in machining and assembly sections and shops. Their use in the sectors, of which the fast change of products is characteristic, makes it possible to increase labor productivity by 1.5- to 2-fold. Here the losses, which are connected with the necessity of the mass replacement of equipment when changing over to the production of new types of items, are reduced drastically.

The Nefteotdacha Interbranch Scientific Technical Complex attached to the Ministry of the Petroleum Industry, the Lazernaya tekhnologiya Interbranch Scientific Technical Complex, and others are also being established. A peculiarity of the latter interbranch scientific technical complex is dual organizational subordination: to the USSR Academy of Sciences and the Ministry of the Electrical Equipment Industry. As a whole the State Committee for Science and Technology coordinates all the work on the formation of interbranch scientific technical complexes, while such complexes are established and reorganized by the USSR Council of Ministers, to which they report back annually.

A peculiarity of the planning of the activity of new complexes is their going directly into the research and development, which have been included in the list of the most important scientific and technical problems and themes of the Comprehensive Program of Scientific and Technical Progress. The intermediate-term and annual planning of the work of all the enterprises and organizations, which are a part of interbranch scientific technical complexes, is unified. Thereby the connection of the Comprehensive Program of Scientific and Technical Progress and the set of plans, including the Basic Directions of Economic and Social Development of the Country for the 10-Year Period and the five-year and annual plans, is ensured. Hence follows the importance of the new complexes as intersectorial organizational structures of the management of scientific and technical development, which contribute to the emergence of long-range scientific and technical development as the load-bearing component of the intermediate-term and annual plans in the area, in which they are connected with the introduction of fundamentally new equipment and with the implementation of the priority directions of scientific and technical development.

Now in case of the formation of interbranch scientific technical complexes particular attention is being directed to overcoming the traditional weakness of academic and sectorial institutes—the lack of development of their experimental base which does not make it possible to produce a prototype on the basis of completed developments. Therefore, the formation of interbranch scientific technical complexes is being accompanied by the strengthening of pilot works. The management of the interbranch scientific technical complex has the right to issue, while the USSR State Committee for Material and Technical Supply is obliged to accept from it not only long-term, but also operational orders for the necessary territorial technical resources both for pilot works and for scientific subdivisions.

In necessary cases engineering centers for the preparation of the introduction of new items in production, as well as regional scientific and technical centers, which work on similar tasks, will be formed in the structure of complexes. It is advisable to establish such engineering centers when the introduction of scientific and technical innovations, moreover, as a rule, fundamentally new ones, has not been ensured due to the lack of the necessary specialists. In such cases the engineering centers of interbranch scientific technical complexes train specialists in the corresponding scientific direction. The center is linked on cost accounting terms with production associations and enterprises of various sectors, which place with it an order for the completion of the corresponding developments or, in turn, fill its orders for the production of the latest technological equipment, accessories, and new materials.

The engineering centers, which are being formed within interbranch scientific technical complexes on the basis of institutes of the Ukrainian Academy of Sciences, since 1984 have taken upon themselves the organization of the production of pilot runs of new equipment, have been acquainting specialists with the opportunities, which its

use in one sector or another affords, and have been modifying new equipment as applied to the specific conditions of operation. Thus, the engineering centers act as an organizational form, which ensures the speeding up of the introduction of scientific and technical innovations and at the same time frees the scientists of an institute—the theorists—from labor-consuming work on the direct introduction of scientific and technical developments in production. Their functions as a whole are analogous to the functions of so-called introducing firms, and the analysis of the first experience of the activity of engineering centers testifies to their effectiveness.

Industrial enterprises, which produce large-series, or mass, products, are not directly a part of interbranch scientific technical complexes, since it is inadvisable to assign the performance of purely economic functions to the academician who is the manager of a complex. As a result, although the organizational gap between the developed prototype and the changeover to the mass production of a new product is decreasing, all the same it remains. In order to overcome it, the USSR State Planning Committee in accordance with the documentation of interbranch scientific technical complexes will include in the production plans of associations and enterprises of industry as mandatory assignments the output of experimental models (if the experimental base of the interbranch scientific technical complex itself is weak), as well as small series of new types of products. Then the composition of the enterprises, which will ensure the mass production of new items in the volumes necessary for the national economy, will be specified with allowance made for the proposed production volumes of the new products.

In this way it is proposed on the basis of new organizational forms to ensure the acceleration of scientific and technical development and to create the prerequisites for the introduction of new equipment.

Footnotes

1. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza" [Materials of the 27th Congress of the Communist Party of the Soviet Unions], Moscow, Politizdat, 1986, p 33.

2. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 33.

3. V.I. Lenin, "Poln. sobr. soch." [Complete Works], Vol 43, pp 278-279.

4. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 329.

5. V.I. Lenin, "Poln. sobr. soch.," Vol 44, p 51.

6. V.I. Lenin, "Poln. sobr. soch.," Vol 43, p 234.

7. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," pp 293-294.

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3. "Mezhotraslevoye upravleniye proizvodstom" [The Intersectorial Management of Production], Moscow, Ekonomika, 1983

4. "Organizatsionnaya struktura upravleniya khozyaystvom" [The Organizational Structure of the Management of the Economy], Moscow, Ekonomika, 1981.

5. "Planirovaniye razvitiya mezhotraslevykh kompleksov" [The Planning of the Development of Interbranch Complexes], Moscow, Izdatelstvo MGU, 1982.

6. Popov, G.Kh., "Effektivnoye upravleniye" [Efficient Management], Moscow, Ekonomika, 1986.

7. "Upravleniye ekonomikoy (Osnovnyye ponyatiya i kategorii)" [The Management of Economy (Basic Concepts and Categories)], Moscow, Ekonomika, 1986.

Supplementary Information on the Theme, Prepared by A. Kazarinov

Interbranch Scientific Technical Complexes: The Problems of Formation

The strategy of the management of scientific and technical progress, which was formulated at the 27th CPSU Congress, requires the available assets to be concentrated in the key directions and freedom to be given to the mass use of reliable technical innovations, which have been checked in practice, in order to obtain from them the maximum return and to carry out quickly and purposefully scientific, planning, and design development, which will ensure an increase of labor productivity by many fold. In order to successfully accomplish the posed tasks, interbranch scientific technical complexes (MNTK's) are being established in our country. They are a new economic organizational form of the interaction of science and production and the uniting of scientific forces and material, technical, and financial resources for the solution of important scientific and technical problems and the development and assimilation of fundamentally new types of equipment and technology.

The task of attaining in the shortest time leading levels in the world in the priority directions of science and technology and of achieving the shortening by many fold of the cycle from scientific research to the practical introduction of its results in the national economy has been posed for interbranch complexes.

The fact that, as many years of practical experience show, the most significant achievements in the sphere of new knowledge have occurred at the meeting point of various fields of science, served the establishment of scientific production associations of a new type. The origination of biophysics and biochemistry, chemical physics and molecular biology, physical chemical mechanics and information science is an example of the expression of the objective regularity of such a process. Research methods and equipment, which were developed by physicists, are being used extensively in modern chemistry, biologists are adopting developments and achievements of electronic computer technology, while specialists in information science are thinking about the use of biological media for the storage and processing of information.

From these examples it is evident that the use in practice of the results of such fields of basic development or ones similar to them no longer fits into the framework of the traditional, sectorial, organization of industry and is running into certain departmental barriers. Interbranch scientific technical complexes are called upon to overcome them and to clear the way for the latest directions of technology and for the most advanced technologies, which by their nature are not only intersectorial, but also multisectorial.

In principle their establishment consolidates the already formed practice of the work of our leading scientific and technical collectives, such as the Institute of Electric Welding imeni Ye.O. Paton of the Ukrainian SSR Academy of Sciences, which has now acquired the status of an interbranch scientific technical complex. This institute was one of the first in the intersectorial approach to the accomplishment of tasks that are important for the national economy. Here an advanced technology and equipment for welding, spraying, soldering on, and the application of coatings, as well as the URI unit—a general-purpose hand tool for the performance of such operations in open space—were developed.

Of course, the institute began not from scratch. It already had a powerful pilot design and technological bureau, an experimental works, and a plant, at which welding equipment was produced. Since the institute dealt with problems of special electrometallurgy, it had the corresponding pilot plant. It also had a specialized design and technological bureau for explosion metal working—again with its own experimental works. All these multisectorial subdivisions were united under the roof of the Institute of Electric Welding of the Ukrainian SSR Academy of Sciences, at which basic research was conducted and the theoretical principles of the latest technologies were developed. Now, having become an interbranch complex, the institute has been strengthened by enterprises of five all-union ministries, which are aiding in an interested manner in the solution of important scientific and technical problems of national economic significance. Thus, for example, work on powder metallurgy has already been started within the interbranch complex. Here the Institute of Problems of Material Science of the Ukrainian SSR Academy of Sciences has become the main organization.

Among the interbranch scientific technical complexes being established it is necessary to note the Tekhnologicheskiye lazery Interbranch Scientific Technical Complex. As was noted above, it has dual subordination—the USSR Academy of Sciences and the USSR Ministry of the Electrical Equipment Industry. Four scientific research institutes and the same number of experimental plants are a part of it. The complex is working on the problems of the development of highly productive equipment and technology of laser cutting and welding, heat treatment, the hardening of tools, as well as the organization of their industrial production.

Another important task of the Tekhnologicheskiye lazery Interbranch Scientific Technical Complex is to achieve the large-scale introduction of laser equipment and the corresponding technology of the processing of materials. This will make it possible to ensure a significant saving of material resources and to increase the quality and durability of the most diverse machines and equipment. Suffice it to recall that just the laser thermal hardening of the head of a cylinder block, which was assimilated at the AvtoZIL Production Association, made it possible to ensure a significant increase of the life of motor vehicle engines. At the laser center a mockup of the first industrial technological laser in our country has already been produced and is being experimentally developed. In essence, it may be a matter of the birth of the future laser industry of our country.

Just as major tasks on the uniting of the efforts of individual institutes and design bureaus were posed for the Personalnyye EVM Interbranch Scientific Technical Complex, of which the Institute of Problems of Information Science of the USSR Academy of Sciences became the main organization.

The plans of the economic and social development of our country for the 12th Five-Year Plan and the period to the end of the century envisage the organization of the mass production of personal computers, the increase of the production volume of computer hardware by 2- to 2.3-fold, as well as the rapid increase of the scale of the use of high-performance computers of all classes.

The Personalnyye EVM Interbranch Scientific Technical Complex should not only develop, but also assimilate the production of systems of microcomputers, which are uniform both in architecture and in the technological design and element bases, including personal computers. Of course, they are obliged to have the appropriate programs and peripheral devices for mass application in the national economy. During the current five-year plan it is planned to produce approximately 1 million personal computers, which not only mathematicians, but also designers, process engineers, physicians, and economists, that is, people of the most different, including

humanities, occupations, will use. All this, of course, presumes that the programs of personal computers will be quite simple and will not require lengthy special training when working with them.

In the plan of the establishment of interbranch scientific technical complexes the practice of integrating science and production, which it is possible to examine on the basis of the example of the Katalizator Interbranch Scientific Technical Complex, which was formed on the basis of the Institute of Catalysis of the Siberian Department of the USSR Academy of Sciences, is rather interesting. It included about 20 organizations of the Siberian Department of the Academy of Sciences, the Ministry of the Chemical Industry, the Ministry of the Petroleum Refining and Petrochemical Industry, the Ministry of Mineral Fertilizer Production, the Ministry of Chemical and Petroleum Machine Building, the Ministry of Instrument Making, Automation Equipment, and Control Systems, and other departments. Despite such a broad departmental range of the complex, here it was all the same possible to specify quite clearly the basic positions of all subsequent work.

The goals and tasks of the complex are the development and assimilation in industry of efficient catalysts, the development and bringing up to introduction or to pilot industrial checking of a new generation of catalysts and new processes based on them, as well as the search for fundamentally new catalytic processes, which make it possible to increase significantly the saving of energy resources and to decrease the production cost of basic types of chemical products.

In the chemical sectors of industry catalysis by right is regarded as a decisive factor of the acceleration of scientific and technical progress. Up to 80 percent and more of the output is produced here with the use of catalytic processes. Motor fuels, sulfuric acid, synthetic rubber, polyethylene, polypropylene, compound fibers—all these are products of catalysis. Moreover, catalytic processes are finding their way more and more into metallurgy, power engineering, the food industry, and the solution of ecological problems. It has already been proven that a good catalyst is the main path to waste-free chemical technologies.

The more the need for new, more efficient catalysts and catalytic processes appears, the more pointedly the problem of their quickest introduction makes itself felt. And here departmentalism was the main obstacles in the way of its solution. Therefore, it was also planned to unite the efforts of different departments in the output of the necessary products. A subdivision, which is capable at the meeting point of science and the sector of solving complex practical problems, was formed on the basis of the Special Design and Technological Bureau of Catalysts of the Ministry of the Chemical Industry, the Omsk Petrochemical Complex, and the department of the Institute of Catalysis of the Siberian Department of the USSR Academy of Sciences, which is engaged in the search for new catalysts and catalytic processes for the deepening of petroleum refining. The data of this experiment made it possible to extend its boundaries and to proceed to the establishment of the interbranch scientific technical complex.

Thus, the interbranch scientific technical complex is a new form of the integration of science and production, which on the organizational level has its own peculiarities. Thus, the interaction of all the units of a complex is of a directive nature. The list of organizations of various ministries and departments, which are a part of the complex, is approved directly by the USSR Council of Ministers. The main organization of the interbranch scientific technical complex—this is a powerful scientific research institute—acts with respect to the enterprises and organizations of the complex as a superior organ of management. The work of all the subdivisions, institutes, design bureaus, and pilot works and plants is carried out according to a unified plan. There is another important peculiarity of interbranch scientific technical complexes. Their activity is not limited just to the development of highly efficient types of equipment, technology, and materials. A mandatory element of their functioning is the promotion of the large-scale duplication of their achievements. For this purpose they submit to planning organs of the country suggestions on the series assimilation of developed innovations and give ministries and departments assistance in their highly efficient use in all interested sectors of the national economy.

A general director, whom the USSR Council of Ministers appoints, is in charge of every interbranch scientific technical complex. As a rule, the manager of the main organization of this complex becomes the general director. A council of the interbranch scientific technical complex, the recommendations of which are mandatory for all the subdivisions participating in the work of the complex, is established for the settlement of the most important scientific, technical, and economic questions.

Planning activity is carried out in the following manner. The main organization of each interbranch complex prepares drafts of scientific and technical programs on the most important national economic problems and unified five-year and annual plans of the conducting of research, development, and pilot production operations and distributes among the performing subdivisions resources and volumes of capital investments. These drafts are then submitted for approval to the ministries and departments, of which the interbranch scientific technical complexes are a part, and are submitted for consideration to the USSR State Committee for Science and Technology. The assignments on the basic indicators of the activity of the interbranch complexes and on the production of the new types of equipment, technology, and materials, which have been developed at them, will be included by the USSR State Planning Committee in the drafts of the state plans of economic and social development of the country.

For the purpose of the economic stabilization of the independence of interbranch scientific technical complexes several centralized funds are established in them. Let us examine, for example, one of them—the bonus fund, which is formed from two sources. From a portion of the assets of interested ministries and departments, which are turned over by them from the corresponding centralized bonus funds, and from a portion of the assets of the material incentive funds of the organizations and enterprises, which are a part of the complex or participate in its work.

It is of considerable importance that the workers of complexes are paid bonuses not for the completion of some intermediate stages or others of the work, but only for the development, assimilation, and introduction of new equipment.

Since the activity of interbranch scientific technical complexes presumes the development of new equipment that is competitive on the world market, the establishment of a centralized fund of currency receipts at them is envisaged. It will be replenished by means of deductions from the assets, which are obtained by the organizations and enterprises of interbranch complexes for the sale of their scientific and technical achievements—licenses and know-how, as well as the output being produced. Another source of the replenishment of this fund is a portion of the currency receipts which were obtained by outside organizations in case of the delivery for export of products that have been produced in accordance with the designs of interbranch scientific technical complexes. In this way the problem of the material interest of the developers of a product, which conforms to the world level or surpasses it, is being solved.

The unused balances of the centralized funds of the interbranch scientific technical complex, both the bonus and the currency funds, are not liable to confiscation and are carried over to the next year. The managers of the organizations and enterprises, which belong to the interbranch complex, have been given the right to hire scientists and engineering and technical personnel for work in more than one job. The material interests of the workers, who are engaged only in scientific organizational activity, are also not encroached upon. Their salaries are established in the same amounts as in the scientific research subdivisions. Moreover, the general director of the interbranch scientific technical complex has the right to increase the wage of the management personnel of the main organization, who do not have an academic degree. This is done within the limits of the established wage fund and only for the performance of functions on the support of the activity of the complex as a whole.

The remuneration of the labor of the staff members of the engineering centers, which are carried on an independent balance sheet, has also been made equal to the remuneration which is envisaged for the corresponding categories of personnel of scientific research institutions, design and technological organizations, and experimental enterprises.

Inasmuch as the interbranch scientific technical complexes are the main organizations in the country for the accomplishment of the scientific and technical tasks that have been assigned to them, thus, they perform and coordinate both basic and applied research and experimental design and technological operations, produce prototypes, and together with ministries and departments bring them up to series production. Moreover, the interbranch scientific technical complexes draw up suggestions for the drafts of the state five-year plans on the development in the country of the corresponding directions of science and technology. In its field each complex determines the prospects of their development and the achievement in the shortest time of practical results which are not inferior to foreign analogs.

Interbranch scientific technical complexes are being established for the practical assimilation of the latest achievements of the basic sciences. For the present there are still few specialists in this field, so the complexes jointly with ministries and departments will also engage in increasing the skills of personnel. On this level they have been granted the right to come forth with suggestions on the organization at higher and secondary specialized educational institutions of the training of students in the new specialties that they need.

Interbranch scientific technical complexes are establishing for themselves automated information banks of data, which will reflect the latest achievements of domestic and foreign science and technology, here they are supplying all interested organizations and enterprises with information.

Moreover, the interbranch scientific technical complexes conduct and coordinate the research and development, which are being carried out in the country, on the corresponding assignments of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000. Back in late 1985, 7 interbranch complexes began performing the functions of the main organizations for 11 problems of 4 priority directions of this program. While as of the middle of 1986 all the other interbranch complexes were granted the right to establish direct scientific, technical, and production relations with the corresponding organizations and enterprises of the CEMA member countries. All this will make it possible to increase substantially the effectiveness of the scientific and technical cooperation of the socialist states.

The problems of the improvement of the management of interbranch scientific technical complexes have already been specified. They depend on the provision of a favorable economic climate, which is necessary for their normal operation, on the establishment of an efficient

system of the supply of material and technical resources, on the formation of truly creative collectives of researchers, engineers, and workers, and on the establishment of close contacts both with collectives of academic institutions and with industry.

Table of Contents

7807

Economic Methods of Management of Scientific, Technical Progress

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[Article by Doctor of Economic Sciences S. Perminov, director of the All-Union Scientific Research Institute of Economic Problems of the Development of Science and Technology: "The Mechanism of Self-Development. Reflections on the Management of Scientific and Technical Progress"; passages in boldface are as published; first three paragraphs are EKONOMICHESKAYA GAZETA introduction]

[Text] The changeover of scientific, planning, design, and technological organizations to full cost accounting presumes the sharp broadening of their independence. It is clear that here forms of the management of science on the part of state organs should also be used. The center of gravity is shifting here to the area of economic methods.

How under these conditions is a unified strategy of scientific and technical development to be preserved?

The author of the article being published reflects on this.

The Zone of Attention of the Center

In case of the changeover of scientific, planning, design, and technological organizations to full cost accounting and self-financing the conclusion of mutually advantageous contracts on the basis of the principle of symmetry of the responsibility of the client and the developer of innovations is envisaged. Such democratization of their interrelations is changing radically the functions of organs of the management of scientific and technical progress.

It is no secret that given the established system of management the bulk of research and development even before their appearance were as if purchased "blindly" by means of assets of the budget and the unified fund for the development of science and technology. Thereby the organs of management—ministries and departments—took upon themselves the further advance of developments into production. As a result feedback was disrupted and the interest of developers in increasing the efficiency and technical level of developments was not ensured.

Under the new conditions the organs of management should perform the role of an active intermediary between the developer and the client, promoting the efficient placement of orders and monitoring their conformity to the unified science and technology policy. Thus, the need for a bureaucratic apparatus of administrative pressure disappears. The center of gravity is shifting to analytical and economic work on the assurance of the most favored treatment for priority and highly efficient developments.

Such an approach creates a real basis for the rejection of a dangerous stereotype—the formation of the scientific and technical potential "from the achieved level." It is no secret that authoritative scientific organizations often live at the expense of old baggage and receive unfounded advantages in the supply with resources. Instances of the elimination of old directions of research in practice are very rare. This leads to a bias in the distribution of resources in favor of established directions of scientific and technical progress (in which the effectiveness of investments is already beginning to decrease) by means of the slowing of the progress of fundamentally new developments, in which the effectiveness of investments is especially great.

For example, the development and production of new construction, including ceramic, materials, which effectively replace ferrous metals, require the reorientation of investments and intellectual efforts. For this it is necessary not only to overcome technical conservatism, but also to display foresight: to foresee the decrease by many fold of the cost of new materials and other science-intensive products with the changeover to their mass production.

In case of the changeover to a system of orders, which are placed on a competitive basis, under the conditions of full cost accounting the opportunity arises for the organizational form to follow the content of the development, and not vice versa. An order can be accepted by any organization which is capable of filling it at a high level. All bureaucratic restrictions in this direction should be eliminated. Such an approach will quickly reveal the potential of scientific research institutes and design bureaus and will determine their real scientific and organizational technical level. Apparently, one must be prepared for the fact that one will have to reject the services of several institutes and design bureaus, which are now prospering at state expense.

The Market of the Scientific Product

The improvement of the economic mechanism in the sphere of science presumes, in essence, the creation of a market of the scientific and technical product. Here the regulation of the market in national economic interests should pursue three basic goals: first, to ensure the implementation of the unified science and technology policy; second, to increase the return from the assets and resources, which are used in developments; third, to speed up the adaptation of the scientific and technical potential to the changing demand for innovations.

What does this mean in practice? First of all it is necessary to establish the most favored economic treatment for highly efficient developments, which for the performers are at times insufficiently profitable or risky. This is ensured by means of flexible contract prices, subsidies, credits, and the stimulation of the cooperation of individual developers. At the same time strict economic sanctions—discounts, additional taxes, and so forth—should be imposed on scientific directions which have already exhausted themselves. This will make it possible to expedite the reorientation of developers toward other tasks.

For the accomplishment of the second goal it is necessary to strengthen the interest of organizations in increasing the cost accounting revenue and to increase the flexibility of prices.

The third goal presumes not so much a change of the production program of scientific and technical organizations as the creation of additional scientific capacities (the pilot experimental base) in priority directions at the expense of the surplus profit, which is derived from the higher contract prices for highly efficient developments. Here the functions of central and sectorial organs of management should consist, in our opinion, in the identification of such a long-range need and the assurance of the cost accounting interest of organizations by preferential financing and material and technical supply. **In other words, the mechanism of the self-development of the scientific and technical potential under state control and on the basis of the principles of self-financing should be set into motion.**

The Reference Point Is the Technical Level

Under present conditions, when a larger and larger number of types of scientific and technical products are assuming the form of individual, special services, in practice it makes no sense to try to encompass the market of the scientific and technical product with a network of physical and volume indicators. This was advisable only when we were attempting by centralized assignments to coordinate supply and demand. Now it is necessary to organize the monitoring of only the key generalizing indicators, which will reveal and prevent a "shortage" of such a scientific and technical product, which conforms to the greatest degree to the needs of the acceleration of the socioeconomic development of the country.

It is first of all necessary to group with such key parameters the scientific and technical level of developments, new products, and production processes, which reflect the technological structure of the economy and can constitute the basis of the profile of management, which is equal to the nature of scientific and technical progress.

Of course, the material basis of technical progress—machines and equipment, that is, the active portion of fixed production capital—will be at the center of attention. Production efficiency for the long-range future depends precisely on their level. For the present the quality and level of the technical solutions, which are being incorporated during the retooling of the production apparatus, actually remain in the background and are not being analyzed and monitored as carefully as the abrupt change of investment and structural policy, which is being carried out in conformity with the decisions of the 27th CPSU Congress, requires.

During the past three five-year plans retooling was not comprehensive, since four-fifths of all the assets being spent on it were used for shifting capital from a low technical and economic level to an average level. And only one-fifth of the assets were channeled into the bringing of production to the highest technical and economic level and into the development of completely mechanized and automated processes. As a result today a significant portion of the fixed capital of industry does not satisfy the present requirements with respect to the level of the automation and mechanization of production and resource conservation and with respect to the quality of the output being produced.

The "philosophy of imitation," which is characteristic of the old economic mechanism, also found expression in the lack of interest in implementing "breakthrough," fundamental developments and in introducing integrated technological systems. This intensified the decline of the output-capital ratio, since the efficiency of capital of the average level (that is, the capital, in which "evolutionary" technical solutions are used and automation and mechanization are of an incomplete nature) is

decreasing especially rapidly. From the analysis it follows, in particular, that during the past three five-year plans the efficiency of capital of an average and low level steadily decreased by 2-3 percent a year. At the same time the efficiency of capital of a high technical level increased by nearly 3 percent a year. This was ensured by the increase of the productivity and shift coefficient of the machines and equipment, which are being used not longer "in bulk," but in a system, in interconnection. One of the fundamental distinctions of "genuine" technical progress from fictitious technical progress, when the increase of the price of a machine leads the improvement of its performance, consists in this.

Such a "stratification" of fixed capital subject to a plus or minus sign in the change of its efficiency demonstrates the necessity of shifting fixed capital wherever possible immediately to the highest technical and economic level, bypassing the average level. This presumes the connecting up of machines and equipment into an integrated system, the complete automation and mechanization of not only basic, but also ancillary works, and the leading production of new generations of equipment. As estimates show, only on this condition is it possible to accomplish the acceleration of economic growth and the radical increase of production efficiency.

The Management of Innovations

Of course, the entire system of the management of the innovation process also requires restructuring. In what should it consist?

First, in the economic mechanism the priority of the indicators of the technical and economic level should be increased and the interests of collectives should be oriented toward the acceleration of scientific and technical progress. This is especially important now, when in conformity with the Law on the State Enterprise (Association) the center of gravity in decision making in the area of retooling is shifting to the level of enterprises. Consequently, the increase of the level should be regarded as one of the basic factors when determining the labor contribution of the collective and the amount of the remuneration of its labor.

For the assurance of the leading development of highly technologically efficient works we consider it expedient to place the enterprises, which are the leaders in the level of products and technology, under more advantageous conditions, establishing for them preferential conditions of amortization, payments to the budget, and the formation of economic stimulation funds. By analogy scales of standards subject to the level of developments should also be established for scientific organizations which have been changed over to full cost accounting. The advantages of the leaders turn, thus, into severe economic sanctions for obsolete works, which is necessary for the overcoming of inertia and the carrying out of thorough technical modernization.

Second, management should be organized with respect to all the stages of the cycle: development—the production of new equipment—its use. As a result of a survey of the technical level of the production apparatus in industry it was revealed that a substantial portion of advanced equipment "is being incorporated" in technological processes of a lower level. Hence, due to incomplete use and disconnection within the unified technological process it is not possible to fully realize its possibilities.

There are a large number of reasons for such a situation. But first of all there are no adequate stimuli to use equipment efficiently, in practice indicators, which characterize the level of new technological processes and the extent of their introduction, are absent in planning and statistics.

As a result technological improvements prove to be indistinguishable in plans and reports, although precisely now not so much the increase of capacities at long established works as the mastering of technological changes, flexibility, and the speed of modernization and restructuring are important.

The Effectiveness of Small Forms

World practice testifies that technological leadership in many sectors is ensured by small scientific and technical organizations. For example, a number of models of personal computers were developed precisely by small firms. The average annual growth rate of the production volume often comes at them to 70-80 percent. The growth of small firms, which are engaged in the production of programs for computers and other information products, as well as management and introducing services, is just as rapid. Experience in the establishment of introducing firms also exists in the socialist countries (the Progress Center in Bulgaria, the Technova Center in Hungary, and others). Being subordinate to the ultimate goals of large-scale production, they boldly assume risk. As experience testifies, explosive growth in the shortest possible time, and not the evolutionary development of technical progress, can be achieved precisely on this organizational basis. Moreover, and this is the most important thing, small forms ensure the masses the broad access to creative scientific and technical work. It is necessary merely to aim such an enormous intellectual potential in the necessary direction, by using economic levers.

Under the conditions of further democratization freedom is being afforded for the initiative and creative scientific and technical work of the masses. The figure of the innovator should be brought to the forefront in the set of social priorities. Surveys show that often precisely the presence of such a resourceful innovator also determines the success of a development.

The stimulation of economic methods of management should not be of a random, uncoordinated nature. The set of economic levers, which are envisaged by the decree

on the changeover of scientific organizations to full cost accounting and self-financing, should be aimed at the implementation of the unified state science and technology policy. This will ensure the irreversible nature of the improvement of the economic mechanism in the sphere of scientific and technical progress on the basis of economic methods and democratic forms of management.

7807

GKNT Official Interviewed

18140143c Moscow IZVESTIYA in Russian 21 Sep 87 p 2

[Interview with S. Yefimenko, deputy chairman of the USSR State Committee for Science and Technology, by A. Ivakhnov: "Science on Cost Accounting"]

[Text] At its 17 September session the CPSU Central Committee Politburo examined and, for the most part, approved the CPSU Central Committee and USSR Council of Ministers decree "On the First Scientific Organizations on Full Cost Accounting and Self-Financing." As this decree stresses, in their activities scientific-research, design and technological organizations should be guided by the USSR Law on State Enterprises (Associations).

The GKNT is already getting questions. Workers from institutes and design offices are phoning in: For what should they be ready and when. What will the instructions be? We decided to help scientists understand these questions.

[Question] How will the new economic mechanism differ from the old?

[Answer] It makes no sense to compare them. The new one is built on a fundamentally different basis. I will attempt to list the "blocks" from which its foundation is made.

The real basis is the principle which was first stated in the June (1987) CPSU Central Committee Conference. The results of scientific institutions' activities are given the status of a commodity. If you use scientific output you must pay for it. This applies to ministries which in some sectors overload their subordinate institutes with all sorts of assignments and behests not commensurate to their potentials or to the scientific interests of sector scientists. Under full cost accounting and self-financing not a single assignment will be made without signing a contract and paying for work completed. The contract will become the sole document defining the relationship between institutions and external organizations.

The system for financing science will change radically. State allocations for supporting numerous NII and KB are now huge: This year they total more than 30 billion rubles. Regardless of whether or not an institute is working for the national economy or if its output sits on the shelf it punctually receives its allocations. Under the new conditions it will have to live by the principle: what you earn is yours.

But in order to earn it will be necessary to win the right to work on a given subject. A competitive process is being introduced: clients will select the institutes, laboratories and temporary collectives they want to work with.

[Question] Suppose for example that I am an institute director. How will my work under these new conditions differ from today's work?

[Answer] In absolutely every way. The implementation of the principles I have cited will make it possible to construct a qualitatively new pattern for the economic life of scientific institutions, which, in its turn, will change all aspects of their work.

Take, for example, planning. The new mechanism gets rid of the mouth numbing fullness of planning outlays for scientific organiations. Higher organizations only determine the basic subject matter of work in the form of state orders. All the remaining is a matter for your initiative.

The work volume for a given period will depend entirely upon how many orders an institute has. If there are no contracts it means that nobody needs your work. Then the question arises as to the advisability of your institution's existence.

As has been said, there will be changes in financing procedures. In addition to the present sources—clients' resources and bank credits—are added a third, the institute's resources. Previously if you had a scientific idea which promised big results you either went to a ministry and asked for resources or you sought out a client who would risk paying for research. Under the new conditions you will have your money and will then have to decide whether to take the risk.

With your own money you will buy equipment, improve living conditions for institute workers, grant bonuses, etc.

You will also earn foreign exchange if your scientific commodity is in demand in foreign countries. Today if you sell something to another country the lion's share of the earnings are collected by the ministry and you are only given the crumbs, and those in rubles. Now a specific share of the foreign exchanged earned will be transferred to your bank account and you will be fully in charge of it.

[Question] Under such a financing situation won't institutes try to get as many orders as they can and complete them as fast as possible, with quality given second priority?

[Answer] We have taken this into account. Today if an institute works poorly this is not reflected in its financing, it still receives all its "own." Under the new economic management mechanism scientific institutions will be economically responsible for their work results. If a customer discovers failures to observe the contracted obligations he has a right to demand compensation from you. You will have to pay this from your profits.

The new economic model provides for two alternatives for economic management activities. The first is based upon the normative distribution of profits. Workers' earnings are included in prime costs of output. When money has to be returned to customers and the institute's profits are reduced, this will influence only the awarding of bonuses. In the second alternative workers' earnings depend entirely upon the results of their labor. After output is sold you deduct the payments to labor, settle accounts with the budget, form a technical and social development fund, and the rest you divide among associates proportionally to their labor in completing the work. In this case your welfare depends to a considerable extent upon work quality. Ministries will decide which alternatives are suitable to various institutes.

[Question] The foundations of the new economic management mechanism have been laid. Now, apparently, is it necessary to construct the building—work out methodologies and instructions according to which scientific institutions can start rearranging their work? As you know, 1988, when this begins, is not far away.

[Answer] You have touched upon the point which is most often asked. We do not advocate working out detailed instructions and statutes, "chewing over" each paragraph of the degree.

The problem's difficulty is in the break in thinking. On the one side there are ministrial workers who are accustomed to ruling over sectoral science, not letting it take a step without the appropriate signatures and paragraphs. On the other side are institute managers who have lost the habit of acting independently. "Give us instructions, put a dog collar on us, so that in a difficult moment we can say that we are held in by reins." If it were not for this collar and reins there would be great space for our initiative. There is also a third side, the auditors. They also have to put up with the fact that the institutes will show independence.

Contract prices are a key factor in the cost accounting being introduced. In this case no methodology is desirable. This is why they are called contract prices, you yourself will negotiate them with the customer. If the GKNT or the ministry were to sit at the table with you, if your hands are tied by instructions, then how can they be contract prices?

[Question] To whom do these new conditions apply and when will they be introduced?

[Answer] Institutes will make the transition to cost accounting together with their sectors. All industry and some of the non-productive sphere will convert to the new conditions by 1989. Contract research subjects for Academy institutes and VUZes will be specified for the same conditions as sector science. Naturally, the state will still support institutes conducting basic research, humanities and other studies which have no direct application in industry.

[Question] What about state orders? Who specifically will act as the customer in the state's name?

[Answer] It is foreseen that this role will be played by ministries and departments. Scientific-technical program assignments will, in particular, be done on state order. Such work will be paid from centralized funds at ministries and agencies. State orders will be given priority and subsidies provided. Work of an intersectoral nature will be ordered by agencies, in particular, our committee.

[Question] The time has come to talk about the second of the GKNT's main tasks—the selection of top priority directions in the development of science intended to put our country in the front ranks of technical progress. What is the committee doing in this direction?

[Answer] Recently a call went out to bring domestic production up to the level of the better world examples. After thinking about this expression, you understand its absurdity; such examples do not exist. They started talking about the highest world level. Recently this formulation has also been refined: It is necessary to assure a pace setting level in the development of science and technology.

These changes make a lot of sense. Experience shows that if you learn that somewhere someone has begun to develop something new in your field of science and technology, this means that you have fallen behind 3-5 years in this work. The world level in scientific development must be reached not with regard to items which are for sale, nor foreign publications, but with regard to results from technological forecasting.

A comprehensive program for scientific-technical progress should make provisions not for the creation of individual machines or items, but for a decisive replacement of technology and the proportional devopment of the national economy. The USSR State Committee for Science and Technology fully recognizes its responsibility for handling this important task.

11574

Growing Role of Science in Industry under Socialism Traced

18140057 Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 87 p 10

[Article by V. Kushlin, doctor of economic sciences: "Socialism and Scientific and Technical Progress"]

[Text] Socialism is the first society in the history of mankind to be built from the very beginning on a scientific foundation. The way was prepared for the revolutionary outburst of the masses leading to October 1917 and the establishment of a qualitatively new social system over a significant portion of the earth by the creative and practical work of the party of communists and the great scientific discoveries of K. Marx, F. Engels and V.I. Lenin. From the first days of existence of the Soviet state, orientation towards science and the most advanced equipment became an inviolable rule of economic policy. In the Program of the Russian Communist Party (Bolsheviks) adopted in 1919, it was emphasized that the party was striving for the "creation of the most favorable conditions of scientific work in its relation to boosting the country's productive forces."

That policy was determinedly developed and put into effect by the party. And to a large extent because of this, our country created in a historically short period of time a developed industrial base in all sectors of the national economy, withstood an unprecedented test of its military might and came out victorious, and developed productive forces to the level of the most powerful countries of the world.

The accelerated development of science and technology is organically inherent in a socialist economy. Socialism and science are indivisible. It would be an error to attribute the major shortcomings at the juncture of the 70s and 80s and the marked lag behind developed capitalist countries in a number of fields of scientific-technical progress to defects of the actual socialist system. They are the result of concrete forms of implementation of policy, the consequence of unfavorable subjective circumstances in guidance of the country and underestimation of the role of active development of socialist production relationships.

Of late, riding the strong wave of just criticism about the shortcomings of the recent past, articles have appeared in the press (taking on a rather belligerent attitude) in which the facts of the last seven decades are drawn up quite selectively and in a biased manner. Their meaning boils down to a denial or ignoring of the positive results achieved in the past in development of the productive forces stimulated by specific socialist social and economic relationships. According to the logic of these assertions, the result frequently is that in our socialist history, except for NEP, nothing worthy of current interest apparently has occurred. But, of course, we can in no way agree with this.

The accomplishment of the GOELRO plan; erection during the early 5-year plans of a broad gamut of enterprises at the highest technical level of that period in record time, as compared to contemporary standards for the developed countries; setting up completely new sectors of production for the country in complex equipment (aviation, motor-vehicle building, the tank industry, tractor building, atomic energy, construction of submarines, and rocket building); the accomplishment of a number of very important projects (for example, going into space); and much more, are not in any way exceptions but milestones that prove the rule in the history of the Land of the Soviets, evidence of the tremendous creative power of the socialist system. Could it be said that economists and social scientists have deeply and thoroughly studied the mechanism of implementing such measures? Apparently not. Yet this could provide much that is beneficial not only for the theory but also for the practice of today's perestroyka in economic management.

Boosting the Payback of Science

The radical perestroyka of the economic mechanism and management of the national economy carried out in the country in conformity with the directives of the June (1987) Plenum of the CPSU Central Committee is bound to open up freedom of initiative and creativity of the masses and union of the most advanced scientific thought with the practical work of revolutionary transformation in production and life.

The level of development and effectiveness of scientific and technical progress (STP) depends on the interrelationship of three global factors: (1) the potential of science and the stock of ideas, discoveries and developments; (2) the structure and urgency of the needs of production and society; and (3) the resource base of scientific and technical development.

An overemphasis on any one of these factors (for example, the potential of science, as happens most frequently) without an adequate accounting of other factors (real resource capabilities in a specific period and place as well as measures of actual need for the use of a new product) is a typical reason for an unsatisfactory rate of scientific and technical progress. The interaction of the mentioned factors should occur in such a way that the potential of the achievements of science constantly meshes with the structure of present and future needs of society and on this basis through comparative measurement with resource capabilities in a planned period a selection is made of the most necessary and effective programs and measures of scientific and technical progress.

The prevailing thesis that science today is greatly ahead of production, having accumulated an excess reserve of ideas and developments, is far from accurate. Apparently, in principle the question should not be asked whether all scientific and technical developments are

immediately and fully realized. It is not wasteful to "overproduce" a little in scientific developments. It does not run counter to the need for maximal improvement in the performance of science. A surplus of ideas and proposals is vitally necessary in the final analysis for the creation of effective developments and innovations. Without the right amount of this surplus, no basis will exist for selection of solutions and there will be no intensification of the economy. Furthermore, we know that expenditures at the research stage are at least ten times lower than the subsequent outlays for the introduction of an innovation. The fact is that "overproduction" of ideas even in the sense of direct savings in expenditures on scientific and technical progress is, as they say, a game which is worth the candle. But serious assessments of the present state of scientific research and technical developments in our country show that this sphere has not exceeded its production capabilities and in many respects lags behind the pressing and future needs of acceleration of social and economic development.

As can be seen from the table, work in the sphere of science in the USSR in the postwar period was characterized by a stable high rate of growth of investment of funds in it. The relative share of resources allocated by the country increased significantly (especially after 1960). In terms of the size of expenditures on science vis-a-vis national income, the USSR in the 70s could already be compared to the United States.

The significant absolute and relative growth of the number of scientific workers and of investment in science occurring in the 60s and 70s did not result, however, in adequately raising its contribution to the national economy. This and subsequent periods of time are associated with the deterioration of the economic situation in the country and the slowdown in the growth of efficiency. The matter of changes in the quality of work of scientific and technical organizations should, in particular, not escape criticism. Among the scientific-research institutes and design bureaus of 24 industrial ministries in the course of the last 10 to 12 years, on average less than one-tenth of all completed topics may be considered above the level of the best domestic and foreign developments. In addition, this indicator shows a tendency toward becoming smaller. Only one-third of all introduced developments in new equipment from these collectives contained even one new invention.

Because of the need for sharply increasing the influence of science on raising the technical level and efficiency of production, the party is implementing at the present time a complex of measures on organically including work of scientific and technical organizations in the activities of associations and enterprises. The network of scientific- production associations is being expanded and many previously independent scientific organizations and design bureaus are being turned over to production associations and enterprises, while the experimental and production base of well-proved scientific-research institutes is being bolstered. Organizations of a new type—MNTK, engineering centers and the like—are being created. In the recently enacted decree of the CPSU Central Committee and the USSR Council of Ministers "On Transfer of Scientific and Technical Organizations to Full Cost Accounting [khozyaystvennyy raschet] and Self-Financing," [Footnote: the full text of the decree will be published in EKONOMICHESKAYA GAZETA], it is planned to change over in the immediate future from financing of scientific organizations to goal-oriented financing of specific work on the basis of contracts with clients interested in this work.

The question of transferring scientific and technical organizations to a system of work meeting the requirements of the economic reform being implemented in the country naturally should not be resolved in one fell swoop. In each sector and organization, careful preparatory work is needed that would take into consideration the specific traits of spheres of activity and the character of the problems.

Commodities of a Special Kind

It would be simplistic to mechanically disseminate the principles of cost-accounting self-support to theoretical and basic science. Both world and domestic experience shows that the attractiveness of profitable developments in this sphere inevitably leads to insignificant topics and could eventually bring on a lag lasting decades in strategically important fields of scientific and technical progress.

At the USSR Academy of Sciences, where most of the basic research in the country is concentrated, the share of economic-contract topics in the total volume of work rose from 7 percent in the 9th Five-Year Plan (1971-1975) to 21 percent during 1981-1985. According to plan estimates for the current 5-year period, it should drop roughly to 14 percent which, it must be assumed, is connected with attempts to bolster the role of academic scientific institutions in the creation of a stock of basic developments able to subsequently exert a revolutionary impact on the national economy. Therefore, in academic and even in VUZ scientific organizations, it would be useful to extend cost-accounting practices clearly only to that portion of work which is directly connected with economic-contract topics.

It is important to carry out the planned expansion of product and money relationships in the operation of scientific institutions and in their relations with enterprises and organizations with an understanding of all the specific factors of this sphere. In evaluating the scientific and technical products of scientific organizations as commodities, one must not take the route of mechanical analogies with material production. These are after all products of a special order. In contradistinction to

ordinary material goods, scientific products do not disappear in the course of their use. Their reproduction is not required in order to use them at another place.

The practice of cost-accounting contract relationships at scientific- research institutions in past years has provided many examples where the high earning power of an organization was achieved through the repeated sale of one and the same development to various clients (disguised to look new on the basis of purely external features). Individual VUZ subdivisions became particularly good at this. Some of them learned, on creating one or two "profitable" developments, how to then live for many years without developing anything new. Such occurrences must not be allowed to become widespread with the all-round transition of science to cost accounting.

It is important to establish a procedure of selling scientific products wherein only the first sale of a development to a customer is done at its full cost. All subsequent sales of the development should definitely be made within the country by dissemination of documentation, and only services for attachment in place, consulting or adjusting would be paid for additionally. The personal interest of scientific-research institutes and design bureaus in broader (repeated) introduction of developments clearly needs to be created primarily through the introduction of a fair mechanism for profits tax, which would go into their funds as a part of the economic effect from the additional profit secured by users of the development.

The Engineering Corps

In light of the requirements of the 27th CPSU Congress, at the present time all sectors and elements of the national economy face exceptionally difficult tasks with respect to cardinally raising the technical level of production. Even in the course of the 12th Five-Year Plan the use of basic technologies should be expanded 1.5- to twofold and attention sharply increased on the development and use of basically new technologies promising triple-digit growth in labor productivity and a marked rise in the effectiveness of use of capital resources, raw and other materials and power. They cannot be solved without making science more active in its interaction with enterprises. But at the same time, it is extremely important to raise the tone of creative work throughout all production.

V.I. Lenin noted that the "intelligence of tens of millions of creative people makes something immesurably higher than the greatest and most gifted foresight."

A decisive turnaround must occur in the engineering corps, especially in the sphere of design of equipment and development of technologies. There are already more than 6 million engineers in the USSR, 3.2 times more than in the United States. But "many" here does not necessarily mean "good." The greatest share of these workers perform functions which are by no means on the level of engineering. How to overcome the devaluation of engineering activity and how to direct it to real creative work and invention are central questions in emergence of equipment and technology to the highest world level.

The solutions adopted in recent years, which take into account the experiment on changing the wage system of scientific workers, designers and technologists being conducted in Leningrad and other cities, provide broad opportunities for the primary reward of those who are capable, who want to work and create effectively, and who help to throw out the dead weight in scientific-engineering units. This process, however, has been developing slowly so far. There are many cases where the transition of organizations to the new wage system is carried out formally. Meanwhile, the ability to implement to the fullest the new procedures for labor remuneration of designers, technologists and other creators of new equipment can serve as a criterion of the capability of a collective to really work on perestroyka as outlined by the party.

One of the most important conditions for raising the technical and economic level of production involves the serious perestroyka of investment policy in all sectors and enterprises. Unfortunately, there are numerous facts, particularly the expert assessments of USSR Stroybank of a large group of enterprise construction and modernization plans recently reviewed and reapproved by ministries and departments, to show that attitudes toward the investment process are still changing very slowly. The overwhelming majority of checked plans which secured new approval from ministries and departments cannot lay claim to being in line with the highest world achievements.

Under the conditions of transition of economic units to self-financing, both for economic science and for the practical work of management, the validation and introduction of an effective mechanism prompting ministries, associations and enterprises to organically combine the investment process with scientific and technical progress in coordination with the long-range program of social and economic development is becoming the number one task.

The transition to forms of production renovation adequate for the tasks of comprehensive intensification of production also is of special importance. The main thing here is to provide in each economic unit a trajectory for the quickest possible materialization of capital investment in projects of a high technical and economical level (regardless of how small the volume of investment might be at the disposal of the given unit).

The whole experience of the Land of the Soviets, with its achievements and costs, attests to the great internal resources of the socialist system for highly effective scientific and technical development. At the present

critical stage, it is important not to be diverted from the path by emotional denials of the past and by designing purely speculative schemes of economic management, but as completely and as comprehensively as possible to understand the real practice of acceleration of scientific and technical progress while taking into consideration the advantages and possibilities of socialism.

7697

Officials Discuss Preparations for Cost Accounting

18140143b Moscow IZVESTIYA 9 Dec 87 p 2

[Article by T. Chanturiya, V. Nevelskiy, Yu. Perepletkin, and A. Vasilev: "Science Learns to Count"]

[Text] **In "Science on Cost Accounting", an interview with S. Yerimenko, deputy chairman of the USSR State Committee for Science and Technology (in No. 264) and in "Orders for Creativity," a report on a "round table" meeting for managers of several scientific-production associations (in No. 299) this paper explained the new system of planning and material incentives which is being introduced in sectoral scientific organizations on 1 January 1988. How are preparations for the new conditions going? At the editors' request, our correspondents asked this of sector institute managers in Leningrad, Tyumen and Tbilisi.**

From the interview with I. Filippov, doctor of technical sciences and head of the Department for Research on Electrical Power Engineering Machinery at the Scientific Research Institute NPO "Elektrosila" one can conclude that at the institute they are still do not have a completely clear idea about applying the economic mechanism to scientific output.

As our interviewee expressed "his" opinion: "Interaction between the customer, the sector and the state should be strictly contractual, with equality of parties and mutual economic responsibility. Institutes should not accept a single assignment without signing a contract or without pay. A contract should be the basic document defining relations between the institute and the external world, including ministries."

These words are completely justified: the new economic mechanism does provide for such relations. What is the subject of the dispute?

The department head answered: "It does indeed, however, the ministries still have more people than they need to handle the new tasks, the "extra" officials will tirelessly search for extra work for the others."

Complaints about ministerial workers are also heard from Tyumen. In the opinion of I. Nesterov, correspondent member of the USSR Academy of Sciences and director of the West Siberian Scientific Research Geological Exploration and Petroleum Institute, decisions to convert sectoral science to full cost accounting are timely, but everything must be done to overcome the hazy and the same time persistent resistance by some workers in the GKNT and ministries.

"In actuality", thinks Ivan Ivanovich, "they do not want the sectoral institutes' hands to be untied. The degree hardly gave scientists free space, however, our Ministry of Geology is quickly compiling all sorts of instructions, the main purpose of which is to limit, cut off, constrain and curtail.

Serious preparations for work under the new conditions are in progress at the institute. Previously there were 16 departments and more than 60 sectors and laboratories. Now there are only 8 large departments, where research on the most important contract themes is concentrated. What then makes the director uneasy?

According to the directives published by the Ministry, planned profits may be less than various types of deductions from them. How can one manage under such conditions?

I. Nesterov's fears cannot be considered groundless. Let us look at just one: The GKNT as an active opponent of any instructions forging independence for scientific collectives, as stressed in the publications cited above.

M. Royter, director of the Siberian Scientific Research and Design Institute for Gas and Oil Field Construction, and a Lenin Prize winner. shared his grievances:

"I am not bragging when I say that, according to last year's results for institutes in our profile, after putting to use all conceivable reserves we had almost the best indicators. Other collectives worked negligently. Now slipshod collectives will obtain 30 percent more for doing the same work that we do. Naturally, people are leaving us to go where living is easier, we are loosing our cadre. We have repeatedly raised this question at Minneftegazstroy, but to no avail.

Admittedly, we did not at all expect this pessimistic answer. After all, the sense of the new decree is: work better and obtain more; create and enlarge the social, cultural and personal service fund and live better.

"Alas", sighs the director, "that is only in theory."

Not only in theory but also in practice. The Institute and the Ministry will certainly find a common language. Hopefully this period of discord will not last too long.

There are also difficulties for Georgian scientists.

G. Mindeli, director of the All-Union Scientific Research and Planning-Design Institute for Low Power Electrical Machinery Technology: "The Law on State Enterprises (Associations) is applied to us through the decree on converting scientific organizations to full cost

accounting. One also had to expect the same from its pay principles. However, according to the law workers earnings are determined by final results from their work, personal labor contribution, etc., that is, there should be practically no ceiling. In fact, since January 1 the same limits and "yokes" have been in effect for various types of earnings which were covered by previous normative documents. We still do not have the right to value at its actual worth the labor of, say, a designer who has provided a talented solution to a chronic problem which has exhausted us. With a clean conscience we would give such a worker a thousand rubles a month, especially when it is taken into account that we plan to produce competitive products—in terms of both embodied ideas and technical use. The requirements for unusual creativity will continue to grow. However, innovators will obtain pay within the bounds of prescribed normatives. Yes, we have premiums at our disposal, but everybody knows that wages are the main stimuli. It is through these latter that the prestige of engineers and scientific workers must be raised.

From this discussion it is easy to understand that the institute is undergoing the first alternative for cost accounting, when the wages fund is formed according the ministry's normatives for the work a unit does on its own, while the material incentives fund is created from profits remaining at the scientific organization's disposal. This residual can be large, or there might be none at all. There is a second, more radical alternative: An institute makes all payments called for by normatives, forms the fund for scientific-technical and social development, while everything remaining goes into a single fund for paying for labor and is distributed among collective members proportionally to each one's contribution to the fulfillment of contractual obligations. However, as our interviews indicated, at scientific organizations they are still somewhat afraid of this second alternative, because then if economic management is unskilled there might not be any wages.

However, with either alternative one can find ways of paying productive labor more than provided for by the "yokes" of the staff description. Participants at our round table described the temporary creative collectives, comprehensive brigades and shock groups they set up. Signing contracts with them, the administration sets in advance the total payment collective members will receive after completing the assignment. In phone calls and letters, workers from scientific organizations asked us to explain this in more detail. We will do this.

Bits of the new experiment, directly linked to the conversion of science to cost accounting, are appearing. Here is a report from Leningrad: At the All-Union Planning-Design Institute for the Technology of Electro-Technical Production they concluded that the present "idea bank" could support them 2-3 years and no longer. Therefore, they set up two brigades of the most skilled specialists, which are released from day to day work and will only work on long term scientific-technical tasks. Their costs are paid by other units.

At the All-Union Institute for Electric Arc Welding Equipment they have set up a staff to prepare for the institute's conversion to cost accounting. This staff's plan for top priority measures is already being implemented.

They also thought about these new events in Georgia. At the institute, headed by G. Mindeli, it was decided to create an "echelon model" of an enterprise, using progressive processes and methods for organizing production, labor and management. With the help of a plan which will be based upon achievements and what should be achieved, calculations will be made of economic indicators for this ideal enterprise, comparisons made with actual enterprises in operation and then the differences will be overcome. This is an idea worthy of imitation.

However, let us return to the problem of the transition period and once again visit Siberia. A. Malyk, director of the West Siberian Department of the Scientific Research Institute for Geophysical Exploration Methods, spoke:

"Not without justification, we fear that the institute will be transformed into an instrument for eliminating log jams for production workers. On contract, or for a stipulated reward, we will patch up holes for them. Of course, our scientific help is necessary for this, but I fear that we might be deflected from our main directions. We think that the institute's main task is to work out methodologies for oil and gas exploration in strata with complex structures. Without this, further growth in explored reserves is improbable. Solutions to this main task by no means bring short term economic results. Who will order this work from us?"

It must be assumed that a solution to this will be found. After all, in addition to contracts with enterprises and associations, the new economic management system provides for orders from the state and from ministries which have sizable funds. They only have to be skillfully used.

What conclusions can be drawn from our roll-call?

Now is the most urgent time at sector scientific organizations. Discussions with clients are being completed, plans and normatives made more precise, there are discussions of progressive forms for the organization and stimulation of labor, and the principles for new relationships with ministries are being explained. The ministries are by no means quietly abandoning their habitual administrative styles of management.

After central economic organs gave ministries initial data (payments for funds, labor resources, allocations to the budget) and these, in their turn gave the required

normatives to their subordinate institutes, the center of gravity for all work shifted to primary components. These are now the front line in the strugle for perestroyka in sectoral science.

Much now depends upon ministries' and agencies' individual work not only with scientific organizations, but also with industrial enterprises. At the GKNT we were given an example of how to correctly formulate this work. At the USSR Minneftekhimprom [Ministry of the Petroleum Refining and Petrochemical Industry] the sector's management took control over restructuring in each NII and KB. Now the ministry is conducting a branch conference, at which representitives from science meet with their clients.

If only the work were done this way at all ministries! As of the beginning of December the USSR Ministry of Fisheries had not given scientific organizations the initial data necessary for conversion. A number of ministries are distributing instructions and methodologies which not only do not help things, but limit the initiative of creative collectives: for example, labor productivity indicators not covered by any directive documents.

Institutes must not wait for "wise instructions" from above. Success depends upon their own entrepreneurial skills. Workers in central economic organs and ministries should, in our opinion, more frequently "get down" to scientific organizations and get acquainted with the questions arising there and help scientists quickly answer them.

11574

Use of Economic Norms in Management of Scientific-Technical Progress

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[Article by A. Zubkov and P. Mezhevich, Mogilev: "Development of Centralized Management of Scientific and Technical Progress on a Normative Basis"]

[Text] The practical work carried out in recent years in a number of sectors of industry within the framework of the economic experiment has given rise to new problems in connection with which it has become necessary to search for additional measures for improvement of management of scientific and technical progress.

First of all, it is important to determine how to put into effect centralized management of scientific and technical development of production and what economic independence and responsibility of enterprises in this field consists of. The competence of management organs of large economic systems involves regulation of resources allocated to enterprises and control of the level of their return (effectiveness), that is, control of the "input" and "output" of elements of the system. As applied to scientific and technical development of the sector, "input" for elements (enterprises) signifies financial resources allocated to them for these purposes by sectoral management organs. "Output" would involve the results of use of the resources, among which it would be possible to allot direct (scientific and technical level of production) and final (sectoral economic effect) resources. These indicators in our opinion are subject to centralized regulation by sectoral management organs. The solution, however, of the remaining questions concerning concrete directions and methods of use of allocated resources should come under the competence of the enterprise itself.

One of the main levers of centralized management of technical development of production is granting it rights to designate ways and proportions of distributing resources for scientific and technical progress. We have in mind the sector's unified fund for development of science and technology (YeFRNT) and the fund for development of production and capital investment allocated for the introduction of new equipment. The directions and rate of scientific and technical progress in the sector depend on how these resources are distributed. Consequently, analysis of the extent of improvement in distribution of such resources and methods of control of their effectiveness can serve as one of the characteristics of the level of centralized management of technical development of production.

At the present time, centralized management is unsatisfactory and has many reserves. This is evidenced by the comparison we carried out of the use of resources for scientific and technical development in the food industry of the UkSSR and the BSSR during 1980-1984. It was found as a result that no unified approach exists in the republic to the forming of an expenditure structure. Thus a comparison of the sizes of shares of resources for conducting scientific-research and experimental-design work allocated for one and the same subsectors of the two ministries (in general, sectoral expenditures for these purposes) showed their significant differences. The given indicators in the republics differ from each other by 20 percent in the baking and starch subsectors, by 1.6-fold in the macaroni and confectionery subsectors and by three- to fourfold in the sugar subsector. Undoubtedly, certain discrepencies, particularly in the sugar and oils and fats industry, are to be explained to a certain degree by different scales of production in the republics. However, it is also clear that in a number of subsectors, the noted differences are largely due to the absence of a unified methodological approach to the solution of this problem.

Important proportions subject to central regulation in the sectors of management of scientific and technical progress are the proportions of distribution of financial resources for conducting scientific-research and experimental-design work and for introducing their results into production. As shown by the conducted research, expenditures on introduction in the food industry of the UkSSR and the BSSR are respectively 93.6 and 84.6 percent of the total sum of the financial resources of the

sectors of scientific and technical development. The existing correlation corresponds on the whole to the proportion recommended by specialists for distribution of resources among the given stages. However, in a number of subsectors, the noted proportion sharply differs from the general for individual directions of scientific and technical progress. Thus in the sugar and macaroni subsectors in work relating to the creation of new kinds of products, in the baking and oils and fats subsectors in work on automation of production of the food industry in the UkSSR and in the two subsectors (baking and oils and fats) in development of new technology for the food industry of the BSSR, the share of expenditures on introduction comprises less than half of the financial resources used in these subsectors for scientific and technical development. The primary financing of outlays on scientific-research and experimental design work, which is inadequate for introduction of their results, results as we know in an accumulation of unrealized developments and in the end in slowing down of the rate of scientific and technical progress.

Analysis of financial outlays for introduction for the individual subsectors of the two republics' food industry revealed significant variations in their distribution. For example, the share of the sugar industry of the UkSSR and three subsectors in the BSSR takes up more than half of the financial resources of the respective sectors spent on them for introduction. At the same time, five subsectors in the food industry of the UkSSR each spend on introduction less than 5 percent of general sectoral funds. A similar picture is also observed in the BSSR.

The conducted analysis of the existing practice of financial planning of scientific and technical development of the food industry of the UkSSR and the BSSR shows quite significant differences in the approach to financing individual subsectors, directions of scientific and technical progress and stages of the cycle "research—production." It is obvious that the respective subsectors of the food industry of the two neighboring republics have roughly an identical production base, employ identical production processes and process for all practical purposes one and the same raw materials. Consequently, the organizational and technical conditions of production cannot serve as the chief cause of such differences. One of the principal reasons (in addition to the absence of a unified methodological approach to the forming of proportions of distribution of funds for scientific and technical development) is that unified scientifically based norms of financing technical progress for the given sector have not been developed. For this reason, the abovementioned proportions basically are formed as the result of subjective ideas of economic managers on the feasibility of this or that variant of expenditure of financial resources as well as the operation of other fortuitous factors.

A most important aspect of centralized management of scientific and technical development is control by sectoral organs of management of scientific and technical progress of the level of effectiveness of use of financial resources allotted for these purposes. The main task is establishing such directions of expenditure of financial resources and methods of control as would ensure their maximum economic effectiveness. Analysis of the given indicator in sectors of the food industry of the UkSSR and the BSSR for 1980-1984 indicates a manifestly inadequate level of use of financial resources, that is, respectively 0.291 and 0.241 of a ruble per ruble of expenditures.

Among the directions examined by us of scientific and technical development of the food industry of the two republics, the most effective is development of new kinds of products—0.885 of a ruble per ruble of outlays, which better than twice exceeds the given indicator for all the other directions. However, for these purposes less than 1 percent of all the financial resources for scientific and technical development of production is allocated in both republics. As for other directions of scientific and technical progress for which a large part of the financial resources is allotted, the effectiveness of their use is below average sectoral values for the given indicators. Thus about 60 percent of the sector's financial resources are spent on work relating to comprehensive mechanization and automation of production in the food industry of the UkSSR, while their return comprises a total of 0.244 and 0.174 of a ruble per ruble of outlays. Approximately the same sort of situation exists in the food industry of the BSSR.

Analysis has shown that cases are typical where one or another direction of scientific and technical progress provides lower effectiveness of expenditure of financial resources compared to others, but their preponderant part is allocated for its development in the sector. The cited data attest to the weak relation of sizes of allocated financial resosurces for basic directions of scientific and technical progress to efficiency of their use and the absence of central monitoring of the effectiveness of research and development in the sector.

The existing situation creates a need of looking for additional ways and methods of developing central management of technical improvement of production. It cannot be exhausted solely by the presently practiced establishment of a central organ for themes of scientific research and the size of financing jurisdictional scientific-research institutes with subsequent collection of information on the technical and economic results of execution of the measures.

The reorientation of centralized management toward primarily economic methods of management is impossible without studying the economic processes occurring in connection with scientific and technical progress in a sector, subsector and region. The chief of them is an undeviating raising of the technical and economic level of production as a result of investment of financial resources in scientific and technical development and, as

a consequence of this, intensive growth of net production in the sector. The study of economic processes presupposes the establishment of quantitative parameters characterizing the special features of their occurrence in sectors, subsectors and union republics. On the basis of these parameters, a higher organization works out a system of norms regulating the scientific and technical development of the sector and passes it on to the enterprises. At the same time, the latter are granted rights in selection of methods of economic activity and resources for the attainment of the transmitted normative indicators.

In this connection, the proper solution of the question of makeup of the norms regulating technical development of production in the sector is of important practical value. The system of norms should include first of all indicators subject to central regulation on the part of the superior management organ. It was pointed out above that these are indicators determining the size of resources allocated to enterprises for technical development and indicators regulating their return. Moreover, the concrete composition of these indicators would vary for different levels of sectoral management: union—republic—production association (enterprise), each of which requires a specific system of norms.

At the present time, the bases for such a system have been created in most sectors. In the food industry, these are norms of formation of the unified fund for development of science and technology differentiated for the union republics, norms of distribution of the unified fund for development of science and technology for republic sectors and subsectors of industry and the chief directions of technical progress. At the level of republic sectors of the food industry, norms are used for deductions of enterprises into the unified fund for development of science and technology and norms of formation of the fund for development of production at enterprises. Norms have been worked out for distribution of financial resources for scientific and technical development for subsectors of industry and the chief directions of scientific and technical progress.

Expansion of the composition of the normative base should be carried out simultaneously with improvement of the quality of the norms themselves. Such work is being done in the food industry in regard to norms of distribution of funds for scientific and technical development for republic sectors and in sectors for subsectors and directions of scientific and technical progress.

The quality of norms is determined by how accurately they reflect the socially required level of any figure. This means that, on the one hand, their formation has to be based on objective economic processes, including acceleration of scientific and technical progress. On the other hand, norms are intended to ensure the production of a maximum economic result under existing conditions of management in a sector. For realization of the first requirement, study is required of the objective economic laws of acceleration of scientific and technical progress and of the second—carrying out of multivariant optimized calculations.

A very important regularity is the interrelationship between sizes of monetary resources invested in scientific and technical development and the produced results. Also, an objective characteristic of scientific and technical progress in the sector is the level of effectiveness (return) of expenditures and its dynamics under the influence of different factors. The research conducted in the food industry has made it possible to determine the parameters of economic processes of two kinds: the influence of invested monetary resources on the sector's economic results and their dynamics and the influence of the sectoral scientific and production base on the level and dynamics of effectiveness of expenditures. The parameters of these economic processes should serve as a basis for forming norms of distribution of monetary resources for scientific and technical development along different directions.

The first kind of economic process has a varying content at different management levels. It is determined by that objective which strives for acceleration of scientific and technical progress at each level.

Investigation of the economic process of the second kind consists of establishing the dependence of the size of the economic effect of scientific and technical progresss on the capital and power intensiveness of labor, the level of its mechanization and the labor, capital, material and scientific intensiveness of production. Such research is conducted by us with the help of a mathematical apparatus of correlation and regression analysis. As a result, mathematical models (regression equations) were produced and used for the calculation of norms characterizing the economic results of scientific and technical progress at different levels of management. Calculation of norms for a planned year is done by means of substituting in the model amounts of actual expenditures on scientific and technical progress in the base year. The following norms were calculated by this method for the food industry: at the union level—growth of profit and commodity production per ruble of outlays on scientific and technical progress for the union republics; at the republic level—the relative (per thousand rubles of outlays on scientific and technical progress) resource intensiveness of production for sectors of industry; the relative reduction of resource intensiveness in the sectors for basic directions of scientific and technical progress; the economic effect (according to the indicator of net production growth) per ruble of outlays on scientific and technical progress for subsectors as a whole and directions of scientific and technical progress within the limits of each subsector.

The obtained norms can be used for validation of the proportions of distribution of monetary resources for scientific and technical progress: at the union level, for

republics, and within the limits of the latter, for sectors of industry and directions of technical progress. At the same time, the distribution of resources should be such that each structural subdivision of the system is assured fulfillment of tasks through scientific and technical development. At the same time, the maximum economic result was secured for the system as a whole.

At the union level of management, this principle is interpreted in the following task: monetary resources allocated for the scientific and technical progress of the food industry of USSR Gosagroprom need to be distributed to the administrations of gosagroproms of union republics so that a maximum growth of annual income (profit) can be achieved for the country's food industry as a whole. However, growth of commodity production no lower than planned has to be achieved in each republic. On this basis, the amount of financial resources allocated to a republic for scientific and technical progress is calculated as the quotient from the division of its planned growth of commodity production through the means of intensive factors for the growth norm of commodity production per ruble of outlays for scientific and technical progress. Growth of the national income (profit) for the country as a whole is calculated as the sum of the produced work of the amount of financial resources allocated to the republics for the growth norm of profit per ruble of outlays for scientific and technical progress for each republic. The last indicator can serve as an estimate of the level of optimality of the plan of distribution of monetary resources at the union level.

The next step is distribution of monetary resources allocated by the food industry of the republic for the subsectors, that is, establishment of their normative need. The size of the monetary resources should be such that the sector secures a maximum economic effect (according to the indicator of net production growth). At the same time, it is important that the level of resource intensiveness of production characterizing the scientific and technical level of production in each subsector attained as the result of this turns out to be no higher than the planned (normative) value. Solution of this problem is possible on the basis of norms of the relative (per thousand rubles of outlays for scientific and technical progress) resource intensiveness of production computed for the subsectors of industry. The size of the monetary resources allocated by it for scientific and technical progress is determined by dividing the planned indicator of resource intensiveness of production in the subsector for the coming year by the norm of relative resource intensiveness. The growth of net production achieved in this for the sector as a whole is calculated as the sum of the produced work of the quantity of monetary resources allocated by the subsector for the growth norm of net production per ruble of outlays on scientific and technical progress.

Norms of reduction of resource intensiveness of production per ruble of outlays computed for directions of technical progress are an instrument of distribution of monetary resources. In forming thematic plans of scientific-research and experimental-design work, these norms can be considered as an economic filter eliminating ineffective research. A theme not providing on introduction normative reduction of resource intensiveness of production should not be included in the plan. As a result, in the sectoral thematic plan of scientific-research and experimental-design work, some directions of scientific and technical progress will be represented by a larger number of themes and others by a smaller one. In this way, the necessary proportions of financing individual directions of technical progress will be formed in the sector. An economic evaluation of such a variant of distribution of funds can be provided when computing growth of net production in the subsector by multiplying the amount of allocated monetary resources by the appropriate growth norms of net production per ruble of expenditures on scientific and technical progress and the subsequent summation of the obtained values for the directions of technical progress. With such a distribution, maximum growth of net production due to technical progress will be attained in the sector, and each direction of scientific and technical progress in it will secure reduction of resource intensiveness of production no lower than the normative value.

At the union sector level, there is the problem of improving the procedure of forming and using monetary resources for the unified fund for development of science and technology. As of now, the question has not been solved of a rational distribution of the monetary resources of this fund for expenditures of conducting scientific-research and experimental-design work and for expenditures of introducing their results in production. The solution of this problem must find expression in the development of norms of distribution of the unified fund for development of science and technology.

At the level of the republic sectors of the food industry, a broader range of problems in the field of normative management of scientific and technical progress needs to be solved. This applies first of all to the formation and use of the monetary resources of the unified fund for development of science and technology at the given manaagement level. According to the new conditions of management, it is permitted at enterprises to leave a part of the unified fund for development of science and technology for the performance of initiating planning and design work as well as compensation for higher expenditures in the period of introduction of new equipment. But, as the analysis showed, the size of the unified fund for development of science and technology left at the disposal of enterprises is found to be largely fortuitous subject to significant fluctuations both for individual enterprises and for the periods of their operation. To all appearances, this size is needed in normative regulation on the part of sectoral management organs.

An important problem that also must be solved at this level is scientific validation of the size of the fund for development of production of enterprises. The new

conditions of management provide for a significant growth of the fund for development of production, but the theoretical validation and methodological working out of its size are inadequate. It is necessary to form scientifically valid norms of deductions into the fund for development of production differentiated according to groups of enterprises.

In regard to the fund for development of production, a satisfactory solution of the problem of its optimal centralization has not been found. The theory and practice of socialist management confirm that complete centralization of the monetary resources of this fund is not rational in the ministry. In this case, enterprises are deprived of independence in technical renewal of production, and their personal interest is reduced in increasing the monetary resources of this fund on the basis of high end results of production. On the other hand, the sector has a number of questions of technical policy whose solution is possible in a centralized way by the ministry for which the latter requires certain monetary resources. Optimal centralization is attainable by means of developing norms of the sizes of monetary resources of the fund for development of production placed at the disposal of a higher organ.

And, finally, an increase in the size of the fund for development of production should occur simultaneously with raising the effectiveness of its use. At the present time, sectoral management organs for all practical purposes do not monitor the effectiveness of expenditures of the monetary resources of this fund. Such control is impossible without norms of effectiveness of use of monetary resources for the different directions of technical progress.

Thus the system of economic norms is the basis of centralized economic management of scientific and technical development of the sector. It makes it possible to allocate monetary resources to republics and subsectors in amounts required for the attainment of goals in a planned period; to establish a normative return of these monetary resources at each level of management in the sector; and to determine rational proportions of financing individual directions of scientific and technical progress.

7697

Planning the Development of Science, Technology in the Regions

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[Text] At all stages of economic construction in our country, the party and the government have paid a great deal of attention to improvement of planning as the central element in managing the development of science and technology. By virtue of the centralized character of economic management, the sectoral aspect of planning scientific and technical progress has developed accordingly. It has such advantages as the possibility of centrally determining a unified state scientific and technical policy on the scale of the entire country; of providing a purposeful direction for scientific and technical progress for the purpose of accelerating social and economic development; and of concentrating financial and material resources for the solution of large-scale scientific and technical problems.

At the present time, the centralized character of planning scientific and technical progress appears only in the sectoral aspect. At the same time, the objective prerequisites developed over the past 10-15 years create a need for a significant increase of influence over scientific and technical progress on the part of local organs of government (at the level of autonomous republic, kray, oblast, city and rayon).

The continuous growth of industrial production volume, "cost" methods of management and development of the scientific and technical revolution have resulted in the fact that practically in any region of the country significant restrictions have arisen either for all kinds of resources or for some of them or one of them, and the ecological situation is deteriorating, that is, negative tendencies are intensifying to a definite degree. Such sectoral organs alone are not in a position to take into account the negative consequences of scientific and technical progress simultaneously in many regions, especially to neutralize them. Consequently, joint planned action of sectoral and regional organs on such processes is required.

Today the development and realization of a regional plan of development of science and technology is becoming possible as a leading component of the plan of economic and social development of a region. The first steps along this direction have already been taken. It was determined that enterprises of union subordination were to present to the proper local planning organs targets of 5-year and annual plans of development of science and technology within a two-week period on receiving them from superior organizations and revisions to be submitted for the indicated targets within a week following adoption of a decision by the proper ministry or department. Certain rights were granted to local organs for the purpose of increasing their influence on speeding up scientific and technical progress in the regions by the decree of the CPSU Central Committee, the Presidium of the USSR Supreme Soviet and the USSR Council of Ministers "On Measures for Further Enhancing the Role and Increasing the Responsibility of Soviets of People's Deputies For Speeding Up Social and Economic Development in the Light of the Decisions of the 27th CPSU Congress." Realization of their rights in the case of individual questions of scientific and technical progress will be more effective on a planned basis.

An important precondition of the need for regional planning of scientific and technical progress is the working out and implementation of the state plan of development of science and technology of a union republic. For example, in the Ukrainian SSR such plans have now been formed for more than 10 years for the entire territory of the republic.

Regional plans of development of science and technology could also became a reality with the existence of departments of scientific and technical progress in the structure of oblast planning commissions. Such departments have been functioning in all the oblast plans of the Ukraine and the Kiev city plan since the beginning of 1984. Moreover, in the process of creation in accordance with the above-mentioned decree of administrations for comprehensive economic and social development attached to ispolkoms of local soviets, it would be useful to assign a unit in their structure to supervision of the development of science and technology.

One other prequisite of the possibility of development and implementation of regional plans of scientific and technical progress is improvement of the regional units of republic automated systems of management of science and technology (RASUNT). This will make it possible to reduce manifold the labor intensiveness of making such plans and to avoid the routine character of compiling their drafts. In the Ukraine, regional units of republic automated systems of management of science and technology have been created in the Donetsk and Odessa oblasts and Kiev. They are being formed in the Dnepropetrovsk, Kiev, Crimean, Lvov and Kharkov oblasts and Sevastopol.

The acquired experience of regional planning of scientific and technical progress confirms the effectiveness of developing and implementing such plans. The first plans of development of science and technology in industry and other sectors of the economy were formed during the 10th Five-Year Plan in Donetsk (with the use of computers) and Kharkov oblasts. During the 11th Five-Year Plan, the group of regions carrying out scientific and technical progress according to plans expanded significantly. In addition to the named oblasts, there were added to them Moscow, Leningrad and oblast, the Voroshilovgrad, Zaporozhye, Rovno and Sverdlovsk oblasts, Kiev and others. The experience of regional planning of scientific and technical progress has undergone significant development in the GDR, Hungary and Mongolia.

Thus working out plans at the regional level is not only possible but also necessary. For this reason the list of questions on whose basis the enterprise coordinates drafts of plans with the local soviet of people's deputies (in accordance with the Law on the State Enterprise) should also reflect problems of scientific and technical progress. Such a plan without a doubt ought not to be just the sum of corresponding plans of associations, enterprises and organizations. Its important features would be, on the one hand, inclusion in it of regional reserves for implementation of scientific and technical progress and, on the other, correction of the chief indicators of this plan through the appropriate ministry or department while taking into account the requirements of providing for comprehensive economic and social development of the given region.

Planning of scientific and technical progress in regions has its own special features which have to be taken into account in the preparation of such plans. This applies first of all to the form of the directions of scientific and technical progress in the various sectors of the region's economy. On the one hand, inasmuch as the sector is a qualitatively homogeneous group of economic units, it is characterized by its own form of directions and a corresponding system of indicators that take into consideration the specific character of the given sector. On the other hand, regional planning of scientific and technical progress cannot be carried out without directions and indicators of development of science and technology that are common for all sectors of the region's economy.

Thus, general directions of scientific and technical progress could be: the creation and development of a new product, improvement of the quality of a product (service); introduction of new equipment, progressive technology and materials; mechanizatioon and automation of production (servicing); scientific labor organization and rationalization of work stations; improvement of management, planning and organization of production (servicing), At the same time, retooling under present-day conditions is a one-time implementation of a complex of measures for all the indicated directions of scientific and technical progress. The basic criterion of effectiveness and aim of retooling, just like, for example, modernization, should be improvement of product (service) quality and/or growth of labor productivity rather than increase of production capacity. The time has now come for replacement of criteria and the purposeful direction of retooling and modernization of existing production. Without this, it would be difficult to go beyond designated levels in raising productiion quality and growth of labor productivity.

As shown by analysis, planning of scientific and technical progress at associations, organizations and at enterprises of different sectors of the economy is conducted on a varying methodological basis, primarily according to the form of directions and indicators of scientific and technical progress. This is one of the obstacles to compilation of a unified plan of development of science and technology in a region. To avoid this, a unified methodological basis for regional planning of scientific and technical progress is needed.

The economy of any region is characterized by regional separation of production associations (combines), constructiion trusts, trading systems and so forth. Their economic units are located in different cities, rayons, oblasts and even union republics. Consequently, when

forming a regional plan of scientific and technical progress, it is important to take into account the necessity of developing initial plans not only for associations, trusts and systems but also for their operational units.

The methodology of regional planning of science and technology also includes tasks, initial data, sources of financing, extent of sectoral and regional plan differentiation, system of directions, indicators and results of scientific and technical progress, structure of the regional plan, reflection of scientific and technical results in plans of economic and social development of regions and organization of development and coordination of the plan of scientific and technical progress.

The system of regional planning of science and technology in the process of its functioning is called upon to solve a number of problems. Due to the development of a unified plan of scientific and technical progress for the region, the need arises of including in it both sectoral and regional interests and possibilities of carrying out scientific and technical progress. As pointed out, the long-range regional comprehensive program of scientific and technical progress serves as a guideline for working out a regional 5-year plan of development of science and technology. Consequently, the problem arises of a sufficiently full reflection of scientific and technical and social and economic forecasts of the development of the given region as well as the solution of regional scientific and technical problems on this level. It is important to take more fully into account the internal reserves both of scientific and technical improvement of associations and enterprises located in the given region and of those connected with regional division and cooperation of labor relating to carrying out scientific and technical progress.

Realization of the principle of combining sectoral and regional management ensures coordination of the draft of the plan for science and technology of the given region with sectoral organs at the preplanning stage. In accordance with the objective of regional planning of scientific and technical progress, it becomes necessary to determine clearly and comprehensively on the scale of the region the rate and chief routes of development of science and technology and to take into account their results in working out the plan of economic and social development of the region.

The large volume of processing preplan information and effectiveness in forming the draft of a regional plan for science and technology require the wide-scale use of computers. A high quality for such a plan can be achieved by means of analysis of its draft at the preplanning stage. Accordingly, the problem arises of analyzing drafts of plans of associations and their production units, enterprises, as well as on the scale of the region. This will make it possible to transform the regional plan of development of science and technology into the chief instrument of management of scientific and technical progress in a region.

Initial data serve as an information base for forming the draft of a regional plan of scientific and technical progress. First, this involves draft outlines, proposals of inventors and rationalizers, materials of certification of work stations and product quality and the results of analysis of the organizational and technical level of associations and enterprises. Second, they can be control figures of a higher organ, requisitions of associations and enterprises for the creation of new and improvement of items already being produced, licenses and patents, information on completed scientific-research and experimental-design work, targets of sectoral, republic and regional scientific and technical programs and scientific and technical forecasts. Most of the original data is in reference and information holdings of regional intersectoral centers of scientific and technical information.

Both sectoral and regional **sources of financing** can be used for financing the regional plan of development of science and technology: centralized and decentralized unified funds for development of science and technology, estimates of expenditures on production, bank loans, the local budget and others.

Analysis shows that a need exists for the action of local organs on funds for development of production of associations and enterprises to be allocated to a significantly larger degree than at present for the introduction of new equipment and progressive technologies. During 1982-1985, only 46.5 percent on the average of the monetary resources credited to these funds for industry of the regions of the Ukrainian SSR was used for carrying out scientific and technical measures. And in Zaporozhye and Dnepropetrovsk oblasts, it was even less—38.3 and 27 percent, respectively.

Credit occupies an insignificant size in the total sum of expenditures for these purposes. On the average for oblasts of the Ukraine, the share of loans from Stroybank amounts to 8.8 percent and from Gosbank—only 1.2 percent. The situation is even worse in individual oblasts. Thus for Zaporozhye and Lvov oblasts, these indicators are respectively equal to 5.4 and 0.9 percent and 5.1 and 0.9 percent.

The above-mentioned decree granted to local soviets of people's deputies the right to include in plans of scientific-research and planning-design organizations located on their territories targets for carrying out scientific-research and experimental-design work for the solution of regional problems and to set targets for enterprises for the manufacture of nonstandard equipment and means of mechanization for the needs of the local economy. This work and products are paid for through the local budget.

One can cite an example of an initiative approach to accomplishment of the decree in Kharkov Oblast. Thus the planning commission of the oblast ispolkom approved 11 methodological materials in which questions were described of specific use of this or that point

of the decree on the scale of the oblast. They include a procedure for including targets in the plan for performing scientific-research and experimental-design work and fabricating nonstandard equipment.

Expansion of the possibilities of financing measures of scientific and technical progress on the part of local organs would also be promoted by the creation of intersectoral and intereconomic regional production associations.

The realization of a single plan of development of science and technology for a region would be successful in the event where it has **sectoral** (for sectors of the economy and industry) and **regional** (for cities and rayons of oblast subordination) **sections.** Sectoral and regional differentiation of the plan provides the possibility of realizing it more specifically and effectively in the localities.

The **system of indicators** of a regional plan of scientific and technical progress should correspond to systems of indicators of the plan of technical development of an association, enterprise and the section "Development of Science and Technology" of the state plan of economic and social development of the union republic and existing statistical reporting on scientific and technical progress. In this connection, it only requires the inclusion of basic indicators of realization of scientific and technical progress and its results. **Results of scientific and technical progress,** which need to be shown in the plan of economic and social development of the region, may include: growth of production volume, labor productivity and profit volume from sales, reduced production cost of products, economy of material resources and reduction of the use of manual labor.

The experience of drawing up regional plans of scientific and technical progress acquired in different regions of the country testifies to different approaches to its **structure.** This applies to sectoral and regional differentiation of the plan, the aggregate of the realized directions of scientific and technical progress, indicators of development of science and technology, its results and inclusion of the stages of the scientific-production cycle "science—equipment—production—consumption."

Take, for example, the structure of the plan of scientific and technical progress of Rovno Oblast. It was formed on the basis of the chief sectors of the oblast's economy as well as from the point of view of cities and rayons of oblast subordination and also includes directions of scientific and technical progress. Moreover, it contains sections for development of invention and rationalization, training and upgrading of qualifications of workers, scientific and technical personnel and employees.

A different structure of the plan exists in Kharkov Oblast. It was worked out solely for industry, contains a different group of directions of scientific and technical progress and includes indicators of economic effectiveness of scientific and technical measures and targets of comprehensive programs.

The same structure of regional plans of scientific and technical progress is to be found only in Donetsk and Voroshilovgrad oblasts, as they were worked out according to the same method. Therefore it is necessary to propose a standard structure for the regional plan of development of science and technology made up of the following sections: I. Carrying out of Basic Research in the Natural, Technical and Social Sciences; II. Solution of Basic Scientific and Technical Problems of an Applied Character; III. Development and Disposition of the Scientific and Technical Potential; IV. Introduction of the Most Important Measures of Scientific and Technical Progress; V. Basic Indicators of Scientific and Technical Progress; VI. Chief Results of Introduction of Scientific and Technical Measures; VII. Chief Indicators of Economic and Social Development of the Region in Which the Results of Scientific and Technical Progress Are Reflected. In such a structure, the regional plan is worked out for the region as a whole. Moreover, its individual sections have to be specifically differentiated: I and III—on the basis of sectors of science, II—on the basis of directions of scientific and technical progress and sectors of the region's economy and industry, IV, V, VI and VII on the basis of directions of scientific and technical progress, sectors of the economy and industry, cities and rayons of oblast (kray, autonomous republic) subordination.

The presented standard structure of the regional plan of development of science and technology makes it possible, first, to encompass all the phases of the scientific-production cycle "science—equipment—production—use," third, to make it integrated (for two directions: USSR Council of Ministers—ministry—enterprise; USSR Council of Ministers—union-republic council of ministers—oblast (ASSR, kray)—enterprise) and, third, for the enterprise to participate more fully in regional division of labor in realization of scientific and technical progress and thereby to make a more significant contribution to acceleration of social and economic development of the region.

The requirement of the 27th CPSU Congress on the necessity of measures wherein targets of the economic plan would be based on achievements of scientific and technical progress could be realized on the condition of development and use of norms of reflection of results of scientific and technical progress at this level. This also applies to the regional level.

The urgency of creating and realizing norms is conditioned by the fact that without scientific and technical progress it would now be impossible to secure comprehensive economic and social development of the region. Moreover, at the same time such norms perform the role of an instrument for the combination of sectoral and regional aspects in planning of science and technology. Sectoral (for sectors of the oblast's economy and industry) and regional (for cities and rayons of oblast subordination) norms are becoming such an instrument due to the fact that the results of scientific and technical

progress have to be reflected at the same time both in sectoral and in regional plans of economic and social development. Consequently, the most effective way of accounting the results of scientific and technical progress in these plans is through norms, moreover, on a prior designated scale.

In this connection, an incomprehensible decision is that of the USSR State Committee for Statistics on deriving from 1986 from the statistical-reporting form (No 10-nt) the results of realization of scientific and technical progress, namely their influence on growth of production output, profit from sales, labor productivity and reduction of production cost. Undoubtedly it is necessary to reduce and simplify reporting, but not in this way. The absence of results of scientific and technical progress does not provide the possibility of determining the degree of influence of scientific and technical measures on the economy of an enterprise, region, sector or industry of the country as a whole.

Norms of reflection can include the relative shares of the results of scientific and technical progress in growth of the chief indicators of a regional plan of economic and social development. Employment of the norms will make it possible to develop the chief indicators of this plan while taking full account of the results of scientific and technical measures at a level ensuring their necessary growth in the planned period. For example, for Donetsk Oblast's industry as a whole during the 11th Five-Year Plan, norms of influence of scientific and technical progress were established at the level of 55-60 percent for growth of commodity-production volume, of 50-60 percent for labor productivity and of 60-65 percent for profit from product sales. Norms were developed for all the sectors of industry and for cities and rayons of oblast subordination while taking regional norms into account.

Use of the normative method of accounting of the results of scientific and technical progress in the region's plan of economic and social development will stimulate associations, enterprises and organizations to introduce the most effective scientific and technical measures influencing the indicators at a level of no lower than the norm. At the same time, the association, enterprise and organization get caught on the horns of a unique dilemma: on the one hand, they must make use of regional norms by virtue of their location and, on the other, because of belonging to the corresponding sector of the economy—sectoral. This will provide an optimal variant of the value of the relative share of the results of scientific and technical progress in the chief indicators of the plan of economic and social development both of the given enterprise and also of the region as a whole.

It would be useful to achieve an optimal combination of sectoral and regional interests and possibilities of scientific and technical development of a specific region through the corresponding **organization of development and coordination of the plan of scientific and technical progress.** Such a process has to be of an iterative character—successive coordination of the interests of sectoral and regional organs.

The order of coordinating sectoral and regional interests and resources in working out the 5-year and annual regional plans of development of science and technology can be the following. Ministries and departments (union, union-republic, republic) transmit to subordinate enterprises (associations, organizations) the draft of control figures for the plan of development of science and technology. The enterprises develop on their basis drafts of plans of technical development and present them to the oblast planning (autonomous republic, kray) commission. The oblast planning commission (with the use of computers) consolidates the drafts of enterprises into a draft of the regional plan of development of science and technology and analyzes it. In case of lack of provision in the planned results of scientific and technical progress of the chief indicators of the plan of economic and social development of the region, it looks for regional reserves for carrying out scientific and technical progress, includes them in the draft of the plan of scientific and technical progress, prepares proposals on correcting estimates of plans of technical development of individual enterprises and transmits them through the oblispolkom to the proper ministry or department.

The ministry or department, on examining these proposals within the period of a month, either adopts them and corrects the control figures or provides a valid refusal and then sends definitively coordinated plans to subordinate enterprises. The enterprises turn over to the oblast planning commission the coordinated plans of technical development, which (through the computer center) consolidates them in the regional plan of development of science and technology and turns them over for approval to a meeting of the oblast soviet of people's deputies as part of the plan of economic and social development.

With such a procedure, the process of regional planning of scientific and technical progress will take place simultaneously with the development of sectoral and regional plans of economic and social development, while the plans for science and technology will become their leading sections. Criteria of completion of iteration in development of the plan of scientific and technical progress can be balancing of scientific and technical development of all sectors of the economy as well as criteria of evaluation of the quality of planning scientific and technical progress in the region. By quality of regional planning of scientific and technical progress there should be understood the aggregate of properties or characteristics determining the degree of suitability of the process of planning to perform its own function—satisfaction of the needs of the region's scientific and technical development.

On the basis of such an approach, the quality of planning scientific and technical progress in a region can be evaluated by the degree of provision of the regional plan of development of science and technology with material, technical, financial and manpower resources; the level of combination in the plan of sectoral and regional interests and possibilities of accomplishing scientific and technical progress on the given territory; and securing (within the limits of norms) growth of the chief indicators of the plan of economic and social development of the region through the results of scientific and technical progress.

Proof of the effectiveness of regional planning of scientific and technical progress will be a quicker and more effective scientific and technical development of those regions where systems of regional management of scientific and technical progress have been formed compared to those regions where such systems do not exist or are in the preparatory stage. Inasmuch as regional comprehensive programs of scientific and technical progress as well as regional scientific and technical programs were developed during the 11th Five-Year Plan in all the oblasts of the Ukrainian SSR, then for comparison let us select oblasts where development of science and technology was carried out on the basis of regional plans or without them. It is important to provide a comparison for the scientific-technical and production potential. Let us select two groups of oblasts meeting these requirements. In the first (Voroshilovgrad, Donetsk and Kharkov oblasts), the development of science and technology was carried out in accordance with regional plans of scientific and technical progress and in the second (Dnepropetrovsk, Zaporozhye and Lvov), without them.

For the analysis, only the chief indicators of effectiveness of scientific and technical progress and development due to this industrial production in the oblasts were selected. On the whole, the results of scientific and technical progress were higher in the first group than in the second. Thus, of the 13 chief indicators characterizing effectiveness of acceleration of scientific and technical progress, their values for 10 indicators were better in the first group of oblasts, identical for 1 and lower only for 2 than in the second group. The higher results of scientific and technical progress in the oblasts of the first group influenced to a significant degree the fact that their industry also developed more effectively than in the oblasts of the second group: the average rate of growth of labor productivity in industry amounted to 13.9 percent. Almost 90 percent of the growth of production output was due to this, while in the second group the figures were respectively 11.8 and 77 percent.

The development and realization of regional plans of development of science and technology serve as a reliable instrument in the hands of local organs for providing scientific and technical and through it comprehensive social and economic development of a region.

7697

Interrelation of Policy, Productive Forces, Science and Industry

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[Article by Professor S. Kheynman, doctor of economic sciences: "Productive Forces—The Scientific and Technical Revolution—Scientific and Technical Policy"]

[Text] The result which our society will get from the introduction of the newest equipment and technology consists of the qualitative transformation of productive forces and improvement of production relationships. The problem of realization in public production of the possibilities of the scientific and technical revolution and its latest stage, which promises a technological revolution in many spheres of production, is determined by this. It can be solved on condition that account is taken of the structure of productive forces and how it takes shape in the epoch of the scientific and technical revolution; new tendencies of the scientific and technical revolution and its possibilities, determining the basic character of development of productive forces in the foreseeable future; and the chief directions of scientific and technical policy and strategy of its realization.

Productive forces and their material elements were always "created with human hands," inasmuch as they were the product of human activity. Byusing the possibilities of the present scientific and technical revolution and its scientific-technical and economic potential and the advantages of socialist production relationships, our society acquires the possibility of planned realization of revolutionary changes in each of the productive forces' elements and to a large degree controls their development.

Of decisive importance in this connection is a unified scientific and technical policy. Its development is of a bilateral character. On the one hand, determination of the problems in the foreseeable future of development of productive forces and production relationships and the attainment of such a level for them, which is necessary so that they could be, in K. Marx's words, "their own foundation" for the full satisfaction of the social and economic needs of socialist society. On the other hand, evaluation of the possibilities of science and technology connected with the further development of the scientific and technical revolution and the growing contribution of production to strengthening the material and technical base of science itself and experimental and pilot-design developments. It is namely at the **junction** of these **requirements of social development and the possibilities of the scientific and technical revolution** that there should be determined the chief directions of a unified scientific and technical policy of the socialist state and consequently the prospects of productive forces' development.

An important aspect of scientific and technical policy is connected with the problem of ensuring readiness of production for the effective use of the possibilities of scientific and technical progress. Here we have in mind the creation and accelerating development of the material and technical base of actual scientific research and experimental and testing development—scientific instrument making, production of chemical reagents and so forth. Later, accelerating development of machine building, its sectoral progress and functional and organizational structure, making it possible to effectively materialize technical solutions; training of personnel capable of embodying in production the possibilities of the scientific and technical revolution.

These aspects of scientific and technical policy organically link up with state structural policy and strategy in the field of organization of public production, including forming of the economic mechanism.

The Present Stage of Development of Productive Forces

The scientific and technical revolution is introducing radical changes in the structure of productive forces and enriches its content. Comprehensive consideration and investigation of these changes are a necessary condition of development of the economic sciences.

In the second half of the last century, material elements of productive forces were defined as the aggregate of the means and objects of labor. With progress of science and technology and development of division of labor and functions in the structure of means of production, new as well as earlier existing ones, but not playing an independent role in fulfilling more limited tasks and elements whose functions under present-day conditions are not limited either by means or objects of labor, are selected and isolated.

It is a question of **power,** which has become the product of a specialized complex of sectors. In addition to the functions of producing heat, light and motive force, it increasingly directly fulfills **the functions of means of labor,** acting on the object of labor.

Modern production is characterized by increasingly complex production and intra- and intersectoral contacts; loss of the uniqueness of all elements of production; the necessity of selecting from a broad range of production alternatives and evaluating its parameters. These tendencies have led to the fact that an important functional element of productive forces, playing an increasingly more active role, became—**information**—its size and quality and system of its replenishment, renewal and movement, acquired by society—and an accompanying increasingly more complex, science-intensive **information industry." Its object and product is information,** performing an increasingly broader complex of functions in public production. It regulates the functioning of the production process; contributes to the development of work on raising the productivity of means of labor and efficiency in the use of objects of labor; helps raise the level and effectiveness of technology and is the basis of improving organization of production and raising its efficiency.

The development of information and growing demands for it have stimulated the creation of cybernetic equipment, which boosts manifold information effectiveness.

Finally, information contributes to boosting preservation of the social product and thus ensures growth of its volume.

At the present time, technology plays an increasingly more active and, in addition, a more decisive role—methods and procedure assigned **before the beginning of functioning of production** of combining in time and space material (including power and information) and personal elements of productive forces required for obtaining an end result. New technological methods eliminate from production a number of traditional means of labor—gigantic facing, vertical turning and other lathes, blooming mills of tremendous proportions, classical spinning and weaving looms and so forth and give rise to new classes of means of labor, acting not only on the surface of objects of labor but also on its molecular, atomic and subatomic structure.

Technology, not being a material element of productive forces, determines the concrete form and functions of means and objects of labor, their combination and accordingly the character and content of labor processes and its economic characteristics.

The creation of technologies with the use of the latest achievements of scientific and technical progress is of tremendous social and economic importance. Organization is urgently necessary of planning and control by technologists (it is almost absent). This could become one of the most important instruments of getting production to correspond to the growing needs of a person and all socialist society.

The rise of science as a direct productive force finds expression in the the fact that **"tools" of scientific research**—technical devices and the like—are transformed into new productive forces and act as creators of prototypes and first series of end products. The principle recognized by science serves as a means of labor, as happens with a critical mass of uranium in nuclear power engineering and the like.

The technique of scientific research provides the collective mind of mankind with knowledge—perception and understanding of processes occurring in nature and society. It creates prototypes of more advanced means and objects of labor, including information equipment.

By creating new knowledge, forming and enriching the collective mind, science in this way undeviatingly improves the creative possibilities of the first productive

force—man. But a description of the modern structure of productive forces would be incomplete without taking into account still another very important element which forms, as it were, a connective tissue, ensuring the functioning of production, interaction of all elements of the productive forces and acceleration of scientific and technical progress.

This element is **organization of production,** a multilevel subsystem located at the junction of productive forces and production relationships. While technology determines ways of combining in time and space all material and personal elements of production **in the process of creating a given end product,** organization of production determines the combination of all material and personal elements of productive forces in the production sector, the shop, the plant, the sector and all public production. This is the **organizational structure** of production designated to ensure its effectiveness. It includes the creation of an economic mechanism and problems of managing production.

Organization of production plays a key role in the field of intensification and acceleration of scientific and technical progress. Radical changes also take place in traditional elements of productive forces—in **means and objects of labor.**

The emergence of new methods of acting on the latter; improvement of automation systems, progress of miniaturization due to the development of electronics; rapid growth of continuously operating units providing sectors with continuous production processes whose automation makes it possible to introduce optimal conditions of operation—all this significantly changes the structure and raises the efficiency of means of labor.

The development of a chemistry of polymers and growing production of the latter, achievements of solid-state physics and its impact on the structure of traditional material, real prospects of rapid introduction of ceramics, glass and wide-scale use of composite materials and so forth radically change the characteristics of basic materials and the balance structure of objects of labor.

The first productive force of society—**man**—acquires a number of very important features. He is not just the creator of the material and technical base of society, the creator of the scientific and technical revolution, the subject on which optimal use by him of the created possibilities depends to a decisive degree. The all-round harmonious development of man and the utmost satisfaction of his growing material and spiritual needs are at the same time the chief **aim** of socialist society.

This superproblem of communist structure—**maximum attention to the improvement and optimal use of the subjective factor**—should be dominant in the process of creation of a material and technical base and provided with resources on a priority basis.

The present stage of scientific and technical progress forms a new (on the basis of its possibilities) **information sphere** for mankind. Created and developed by people, it creates at the same time material prerequisites for the most radical impacts on their consciousness, psyche, abilities and life positions. This is a process requiring the development of a long-range strategy. In public production, human qualitative traits will play an increasingly important role. It seems to us that at the new stage of the scientific and technical revolution, when automation involving the use of microprocessors will develop at an accelerating rate, the functions of a leader will lay claim more actively in addition to the biological sciences to psychology, the science of human intelligence, world outlook and his creative possibilities, ensuring the harmonious development of the scientific and technical revolution.

The means and objects of labor, power, in all its diversisty of functions, technology and information are elements together with the human factor, science and organization of production that form the structure of the productive forces of the developed countries.

By the beginning of the'80s, productive forces in the USSR had grown sharply and achieved a high level. National wealth increased 2.7-fold during 1971-1986 and amounts to 3.8 rubles (less the value of land, mineral deposits and forests). Fixed production capital increased 3.1-fold and reached 1.6 trillion rubles. The power component of the productive forces is based on the country's large-capacity power resources. Production (output) of fuel in 1986 reached 2,165 million tons and electric power—1,599 billion kilowatt hours. Consumption of electric power in industry amounted to 922.3 billion kilowatt hours; smelting of steel and production of the finished rolled product were respectively 161 and 112 million tons and production of synthetic resins, plastics and chemical fibers was 5.3 and 1.5 million tons. The USSR occupies the leading position in the world in production of metal-cutting machine tools, tractors, grain-harvesting combines, mainline electric and diesel locomotives.

Workers' skill level has changed radically. In the'60s, 22.8 million persons obtained a secondary or secondary specialized education, in the'70s—44.2 million persons and during 1981-1986—28.2 million persons. Higher education was acquired respectively by 4.35, 7.32 and 5.07 million persons. As a result, the number of persons with higher or secondary education grew from 58.7 million in 1959 to 161.2 million in 1986, or 2.7-fold in 27 years.

Progress of productive forces has provided significant growth of labor productivity: in 1960—fourfold versus 1940, in the'60s—1.85-fold, in the'70s—1.46-fold and in 1981-1986—1.2-fold. Growth of labor productivity permits society to allocate an increasingly larger mass of manpower resources to the nonproductive sphere for the satisfaction of the population's requirements for knowledge and spiritual benefits.

Whereas in 1940, for every 100 persons employed in material production there were in the sphere of personal services, including retail trade and public dining (less state and public organizations), 12.3 persons, in 1960—20.9 persons, in 1970—32.9, in 1980—39.0 and in 1986—44.2 persons. This is an impressive result of the development of productive forces and rise of labor productivity.

A common feature characterizing USSR productive forces (as well as those of other developed countries) toward the beginning of the'80s is the **coexistence** introduced into all units of public production of "creations of the scientific and technical revolution," displaying a significant inertial energy of traditional elements of production.

Success in advancement of the achievements of the scientific and technical revolution is determined by the relation of "new" and "old" and the inertia of traditional productive forces. The scientific and technical revolution influences traditional equipment, attaching new elements to it. This applies to numerical-control systems and other kinds of automatic instruments and equipment intensifying the operation of traditional equipment and technology. Creations of the scientific and technical revolution have as yet not become predominant and in this sense one cannot speak of "victory" of the scientific and technical revolution.

Productive forces of the developed countries of the world are to be characterized on the basis of individual functional elements:

a strong power base founded on the use of traditional mineral fuel with a so far small relative share of such achievements of the scientific and technical revolution as nuclear electric power stations, a very small relative share of nontraditional sources of energy (wind, geothermal, tide and solar) and so far a total absence of thermonuclear power. The beneficial use of primary energy as a whole does not exceed 30-40 percent, while the technological bases of production of electricity and heat remain for all practical purposes at the level of the'40s and'50s;

a significantly expanded spectrum of **building materials** and a growing relative share of synthetic materials and sharply growing possibilities (especially of solid-state physics) influencing the basic characteristics of traditional materials. Still by the beginning of the'80s, the predominant place is occupied by ferrous and nonferrous metals, cement and materials of wood origin.[1] Polymers as yet have not replaced metal on any sort of significant scale;

a broad spectrum of new ways of affecting objects of labor in the field of **technology.** Possibilities are opening up for the more complete extraction and employment of all useful components of raw and other materials, and the horizons of waste-free technology are coming into view.

Despite these numerous "new sprouts," traditional technology, first of all in labor and capital-intensive sectors of the extractive industry, predominates in most production operations. Such a power- and resource-intensive sector as ferrous metallurgy operates on the basis of an ineffective in the sense of outlays of power, labor and other resources and actually intermittent technology. In machine building, a combination predominates of cutting technology and plastic deformation on the basis of utilization of metal-cutting machine tools and forging and pressing machines. Traditional technology remains predominant in agriculture and construction.

The new features of the tools of labor include: multiple growth of unity capacity (up to a certain limit of stepped-up economic effectiveness of a unit's operation); in addition to improvement of the working tool, development of multifunctionality—the combination in one unit of performance of several functions; fitting of equipment with electronics and new means of acting on objects of labor and change in the character of this influence, the appearance of electric units, electrochemical, electron-ray, chemical, biochemical and other types of equipment.

Automation is the most important characteristic of modern tools of labor, acquiring an increasingly larger relative share of the characteristics of modern tools of labor. Their integral structural part is becoming cybernetic equipment—modeling, computing and controlling devices. They form the technical basis of modern communications of production and nonproduction designation, create a formerly unthinkable material and technical base for the new information sphere of society and exert a tremendous influence on production relationships and the superstructure of society.

At the same time, automatic devices, electro- and electron-chemical, laser and other creations of the scientific and technical revolution still occupy a minor place in production and even in its vanguard—machine building. In 1986, the share of metal-cutting machine tools with numerical control amounted to 16 percent of their total output. The number of automated management systems, numerical control and automatic manipulators (robots) is growing, but there are still not enough of them. According to data of the USSR State Committee for Statistics, during 1971-1986, 11,087 automated management systems were created. Of them, 4,884 were automated management systems for production processes and 1,566 were automated management systems for enterprises. Production and the use of microprocessors were organized, but their fitting out of production and transport equipment is as yet in the initial stages. Gene engineering is being introduced into production. But in the opinion of specialists, this is only an experimental stage.

Thus the scientific and technical revolution has disclosed vast possibilities for improvement of production and showed their practical applicability. But despite

revolutionary breakthroughs in a number of directions toward the end of the'80s, it still **has not gained a victory over traditional equipment and technology, which are still dominant in production.** Productive forces have not become not only in full but even in significant measure the materialized embodiment of the possibilities of the scientific and technical revolution. The further introduction and utilization of equipment and technology will require new efforts of the basic sciences. Accordingly, in our view, the category **"scientific and technical revolution in operation"** should be introduced into scientific use. Only in this role does the scientific and technical revolution exert a direct influence (unfortunately, not only constructive but destructive) on the destiny of mankind.

In scientific discussions, the questions arise: has the contemporary scientific and technical revolution ended or is it ending now? Is it permanent? Has a new stage started or is a new scientific and technical revolution being born?

On the basis of what was said above, the present scientific and technical revolution cannot be considered to be over. However, its continuation is not restricted to the realization of existing possibilities. The logic of development of the scientific and technical revolution determines the emergence of new possibilities which within the limits of existing directions significantly exceed earlier created potentials. This makes it possible to speak of the establishment of a new stage of the scientific and technical revolution. At the same time, fundamentally different possibilities and directions of the basic and to a certain extent of the applied sciences are to be seen, which in the remote future could result in the appearance and establishment of a **new scientific and technical revolution.** A leading role in this will be played by the results of research of the biological sciences and their influence on all the elements of productive forces. Thus, it can be asserted that the scientific and technical revolution is continuing.

The introduction into scientific usage of the category the "scientific and technical revolution in operation" and analysis of the structure and actual state of productive forces, their inertial mass and so forth are in our view of major fundamental significance.

Frequently, when describing the production apparatus at the beginning of the 21st century, people proceed from the perspectives of development of the natural sciences. But at the same time they do not take into account the extent of their materialization and, the main thing, the necessity of providing a material and technical base for developed production as well as the possibilities for the creation of a new production apparatus. Thus utopian constructs are born which can disorient planned society and its managerial organs. This does not mean ignoring remote perspectives. It is necessary to create a scientific and technical reserve for gradual progress toward them.

The problem of development of the scientific and technical revolution from a basic scientific idea to its embodiment in public production is of major fundamental and practical importance. We validated above the actual meaning of the category of "scientific and technical revolution in operation." At the present time, when the processes and possibilities of the scientific and technical revolution are being broadly illuminated in popular publications, the danger exists of mixing or even of identification: **flashes** of scientific ideas, technically not yet realized; **isolated disseminations,** that is, isolated experimental, pilot specimens not verified from the point of view of economic effectiveness; a new technical level of production attained as the result of use of new equipment.

Some scientific and planning personnel accept such "flashes" and "disseminations" as a new world level and impetuously call for its attainment instead of creating a scientific-technical and organizational stockpile of work for planned movement along new directions. One might not complain about these appeals if they were often accompanied by planned decisions, as happened recently with robots and possibly could occur with flexible automated production operations. According to available data, during the'80s, the park of automatic manipulators (robots) consisted of: in the United States—20,000 and in Japan—64,000. In the USSR, 13,500 robots were manufactured in 1986 and 10,000 in the first 10 months of 1987. A considerable portion of them does not operate, but the payback of many is measured over fantastic periods, that is, **a significant portion of production accumulation was found to be withdrawn. The necessity is therefore clearly of a serious "sobering" and in the future development of an economically justifiable introduction of new equipment and on this basis, real progress toward the world level.**

The Scientific and Technical Revolution Continues. Present Stage of the Scientific and Technical Revolution

The conditions determining the present stage of development of the scientific and technical revolution and its basic components are complex and diverse. The first of them is the internal logic of development of the sciences themselves. The growing flow of information, arising from the precipitously growing and technically increasingly more advanced material and technical base of science, attests to new facts, designates new questions, makes doubtful many, seemingly generally acknowledged theories and hypotheses and stimulates searches for answers to them. This leads to a search for more general conceptions in which such information would be entered. Man's cognitive opportunities and stimuli of growth of his "inquisitiveness" have grown immeasurably.

The second condition is the **logic of development of large-scale machine production.** Finding itself under the influence of the progress of science and growing needs of society, it gives rise to contradictions which can be resolved only on the basis of basic and applied research.

The third condition is the gigantically growing scale of impact of material production on the environment, resulting in certain, frequently irreversible, negative consequences. This has brought to the foreground **a broad complex of ecological problems whose solution is possible only on the basis of efforts of the basic sciences.**

The fourth condition is that in the process of development of modern civilization, **problems arise** periodically on **national and global** levels, varying in origin but always giving rise to large-scale, quite imperative "orders" to the basic and applied sciences.

We shall call the fifth condition **feedback of the process of development of the scientific and technical revolution with its already realized possibilities.** "Offspring of the scientific and technical revolution put into production" and interacting with all the elements of the production and external environment, have begun to disclose an innumerable number of unforeseen consequences and side effects. The need has arisen in major research for **conditions of functioning of many of the achievements of the scientific and technical revolution** and correspondingly for working out basic and applied problems aimed at the attainment of **optimal adaptation of these innovations in the surroundings of their functioning and use.**

Such are the conditions of **the forming of a new stage of the scientific and technical revolution** and the development of society's productive forces. One of the chief features of this stage is connected with interaction of science, its material and technical base ("scientific industry") and the sum total of knowledge at the disposal of mankind. It is equipped with an essentially new **acute and minute "vision" and with precise and all-penetrating measuring instruments of states and processes** for any intervals of time and space. This means a **transition to a qualitatively new and higher level of cognition** both of the "world not made by hands" surrounding us and of the world created by mankind. Opportunities are increasing of active use of knowledge—of its transformation, in the words of K. Marx, from a means of explanation of the world to a means of its change.

Thus, the economic significance of the new stage of the scientific and technical revolution lies in the creation of a new scientific, production and technical base of intensification of actual scientific research, intensification of production, expansion of the possibilities of automation and a radical change in the content and character of labor.

Possibilities of the Present Stage of the Scientific and Technical Revolution and Basic Directions of Scientific and Technical Policy

In **the field of power engineering,** scientific and technical policy has to provide, on the one hand, major technological and technical changes in production of power and in the structure of primary power carriers and, on the other, to contribute to reduction of power intensiveness of production, introduction of power-saving technology and boosting the efficiency and power economizing bent of power-using equipment.

Together with progress of atomic power engineering, the problem of controlled thermonuclear synthesis must be solved while ensuring guaranteed safety and ecological cleanliness through efforts of the physical sciences. The search is going on for ways of raising the temperature of the superconducting function, new types and mechanisms of nuclear reactions and searches related to them for superdense and supercharged cores which could be used as nuclear fuel. Major opportunities are being opened up by the study of photochemical reactions and the mechanism of photosynthesis. In this field, in addition to chemists, biologists are intensively working investigating reactions in which the energy of a quantum of light is transformed into chemical energy. The new possibilities open up the development of basic research in the field of mastery of the process of converting without combustion through oxidation chemical into electrical energy, which promises extraordinarily high efficiency. Developments relating to the creation of enzymatic fuel elements are connected with this. Good prospects in basic, theoretical and experimental research connected with the synthesis of catalytic systems, capable of decomposing water (photoreaction) into hydrogen and oxygen under the action of solar and ultraviolet radiation.

The basic and applied sciences are developing and beginning to employ nontraditional sources of power, including the little-used hydrocarbons—shale, petroleum sand—and to produce liquid fuel from low-calory coal as well as to use the energy of the sun and so forth.

In the sphere of use of power, it is necessary to stimulate progress of technology and a significant rise in efficiency of primary power carriers in the process of their transformation into electricity, heat and various forms of technological action. It is important to be oriented toward improvement of power-using technology and technical devices so as to boost the effect in reduction of physical outlays of power.

In the **field of technology and means of labor,** the policy of intensification is connected with the creation and introduction of more effective catalysts in sectors with processes of the continuous type. At the junction of chemical and biological sciences, major opportunities are being opened up by the use of the mechanism of enzymatic catalysis of the principles of enzyme operation.

Chemical research connected with lasers makes it possible to use beams of light with high density of power as chemical reagents which can either directly take part in molecular reactions or monitor and direct the course of a reaction for producing substances with previously designated properties. Lasers create means of labor of a new type of effect on an object of labor. Good prospects

are promised by the creation of artificial membranes and the development of a membrane technology of reactions. The research in particular promotes the development of new waste-free technologies.

These possibilities accelerate and expand the creation and introduction of production systems, ensuring an optimum effect on an object of labor—its surface and internal structures and on physical and chemical properties following attainment of a useful effect and minimization of power and other outlays on such processes.

Technical policy must influence the use and protection of organic objects of production of organic origin—the land and its surface, mineral resources, forests, the hydrosphere, that is, to orient toward an **economical technology,** guaranteeing the safety of the habitation sphere and of procured or produced resources.

Progress of tools of labor. It is important to direct technical policy in the field of means of labor to capital and labor intensive sectors of the extractive industry and sectors with continuous processes of production for a radical improvement of technology (hydraulic mining and gasification in the coal industry, direct metallic reduction and continuous casting of steel in ferrous metallurgy and the like) and the creation of new kinds of production and moving equipment.

One of the central problems of scientific and technical policy is connected with the wide-scale introduction of means of automation—systems of automatic design, automatic production and transporting-moving equipment provided with numerical control, processing centers, industrial manipulators (robots) and the like. These means of labor, forming flexible automatic production operations, have feedback by means of electron control devices determining the technological sequence of the working process.

An important role is played by expansion of the use of semiconductor technology and precipitous growth, improvement and reduction of the cost of production and use of microprocessors and integrated circuits.[2]

The tremendous economic and social importance of these innovations lies in the fact that they serve as the basis of dissemination of means of automation in sectors with medium-, small-series and unit production, a combination of automation with rapid replacement of types and models of products and the creation and expansion of flexible automated production. These tendencies with their rational realization will remove many economic restrictions in the field of automation of production. We refer to the **establishment of not only automated but also fully automated production.**

Scientific and technical policy should also strive for integrated mechanization of production with traditional equipment. We have in mind expansion of output and improvement of materials handling, testing, diagnostic, repair and other equipment for auxiliary production.

A major problem of scientific and technical policy is ensuring flexibility for the created equipment, a high level of standardization, succession of subsequent generations of means of labor and introduction of modular, unit principles for its design, production and modernization. This is the principal way of solving one of the chief and most complex economic tasks of scientific and technical progress—combining growing complexity, durability, high cost and a high level of specialization of tools of labor with rapid replacement, renewal and growing diversity of objects and products of labor. This is also accompanied by a reduction of series-produced equipment. For such a combination not to produce growth of expanditures, inadequate amortization and loss of effect, which is always brought about by mass production, a high level of flexibility is required of equipment, technology and organization of production.

A general aim of technical policy in the field of tools of labor is raising the technical level and unit capacity of machines, which is accompanied by reduction of their cost per productivity unit. The same sort of task is optimization of the technical base of produced equipment through the creation on a modular basis of specialized equipment whose parameters correspond to the conditions of its operation.

Let us examine the **field of improvement of objects of labor and provision of materials for production.** A composite part of the present stage of scientific and technical progress is the revolution in **objects of labor,** eliminating their former passivity and inertia. Properties of objects of labor and the attainment of their required quantity are becoming increasingly more controllable through their parameters.

Solid-state physics creates increasingly more effective methods of acting on the structure of a substance, including the atomic structure, and expands the possibilities of control over characteristics of materials. The successes of semiconductor physics facilitate the development of the theory and technology of production of perfect crystals. Technical policy should be aimed at the search for new classes of semiconductors and the improvement of the technology of their production. Ever greater opportunities are being disclosed by the physics of reduced dimensions connected with the creation of reinforced fibers [armiruyushchiyye volokna], composite materials and the like.

At the present stage of the scientific and technical revolution, development is being accelerated of new sciences, opening up prospects of improvement of objects of labor and productive forces as a whole. They can be called **sciences of behavior of substances and of**

products from them under conditions of their functioning. Here possibilities are displayed of investigation and penetration **into the internal structure of the processes of production functioning** in interaction with elements taking part in them and the possibilities of intensification of all stages of the production process. This is **the physics of surfaces,** which studies the properties of structures playing an important role in the solution of problems of resistance to wear and in the study of properties of supermobility. The physics of surfaces is becoming a basic science solving problems of materials study.

The importance of **the physics of disordered systems** is growing. Its object is promising amorphous randomized substances such as ceramics and glass. Broad use is planned of ceramics in motor-vehicle engines, gas turbines, magnetohydrodynamic generators and so forth. Conducted research is promising in the field of creation of tools for cutting, drilling and grinding. The physics of disordered systems is also the basis of contemporary microelectronics, the theory of ideal crystals and crystals with isolated irregularities and so forth.

Problems of materials are also being solved by the chemical sciences, particularly solid-state chemistry, which likewise is making a contribution to **the science of behavior of matter and materials under different conditions of their utilization and functioning.** It investigates the electrical and optical properties of organometallic compounds and other materials; chemical surface sorption with different characteristics in such processes as friction, lubrication and wear; liquid crystals and reactions to external influences.

The possibility is opening up of synthesis of new materials with growing use of nontraditional raw materials and replacement of petroleum products. Study of the structure and behavior of macromolecules in amorphous and crystal structures and the nature of the surface of polymers enhances the role of the latter. Conditions are being created for the development of new directions of use of polymer materials.

A concern of scientific and technical policy in the sphere of procurement of raw materials and production of materials ought to be reduction of capital and labor intensiveness, orientation toward the consumer—production of materials approximating the parameters of the end product and expansion of their assortment. A significant increase is expected in the share of material resources obtained from the ocean.

New possibilities are connected with modern biology, including molecular and especially gene and cell engineering. Progress of biochemistry and the study of enzymes and their action open up the laws of regulation and energy provision of processes occurring in the cell. Molecular biology and molecular genetics influence the mechanism of heredity. Bioorganic chemistry creates methods of chemical synthesis of powerful bioregulators. Genetic engineering is successfully moving toward the production of proteins of man, plants and animals. Cell engineering opens up the possibilities of progress of immunology and production of antibodies for the most importance viruses of human diseases.

A most important direction of the scientific and technical revolution is connected with the **information sphere and the information industry.** The information industry and a global system of communication are becoming components and a characteristic of the level of development of productive forces and industrial power.

Such are some of the possibilities of the scientific and technical revolution's new stage whose development is taking place in the'80s and will continue into the'90s. Their optimal use is a most important task of scientific and technical policy.

Machine Building—The Material Basis of Realization of Scientific and Technical Policy

In the development of productive forces and realization of scientific and technical policy, a key role belongs to machine building. In its present structure and organization, the park of metalworking equipment is frequently not used for new-equipment production. Less than half of such equipment is to be found at machine-building enterprises of the machine-building ministries. At machine-building plants, about 30 percent of the equipment is operated in tool and repair shops. Only two-fifths of the country's metalworking equipment is used for production of new equipment.

Overcoming such a situation requires each machine-building sector to provide all the produced equipment by assembly of replaceable components and parts for its repair and modernization as well as specialized tools and manufacturing equipment. There is still another organizational condition—the creation of plants or shops in basic sectors of machine building for fulfilling individual orders of scientific-research institutes and enterprises for the production of nonstandard technical devices.

Chief attention is frequently paid in the press to types and capacities of produced machines. Capital investment is essentially allocated for the creation of new capacities for the production of a large quantity of traditional and some new types of equipment. Considering all the importance of such an approach, it is necessary to take into consideration that this does not reduce the number and the scale of the problems not being solved by machine building. It is essential to solve the problems of radical improvement of machine building's structure and organization.

A first-priority direction in this field is raising the level of **production's specialization. It is important to strengthen object specialization and to eliminate dispersing the production of products of the same type at many enterprises. In mass-production sectors, one should improve part and manufacturing specialization, develop**

enterprises of functional specialization (of the bearing industry type) and the production of functional units of intersectoral type. These enterprises should become an important constituent in the system of enterprises of intersectoral production operations. A network of enterprises of functional specialization and wide-scale introduction of the modular principle of equipment production with comprehensive standardization of its components and parts could be called the "infrastructure" of technical progress.

Strengthening orientation toward the consumer, responsibility and activity of machine builders in the use, acceptance, repair and modernization of equipment, that is the development of machine service, is of most important significance. All this will make it possible to use more fully the park of metalworking equipment. Only with the existence of such a condition would machine building be able to renew the production apparatus of the national economy and create new equipment.

The country's productive forces constitute a large and complex system continuously functioning in public production. Their qualitative transformation, realization of the possibilities of the scientific and technical revolution, creation and introduction of fundamentally new technologies and equipment and intensification of the economy—all are indissolubly connected to progressive **organization of production.**

The present stage of the scientific and technical revolution is characterized by a constantly increasing acute need of creating new possibilities of ensuring radical changes in the organization of public production at all its levels. Scientific and technical policy must predetermine the most important directions of public production's organization—a strategy of renewal and modernization of equipment, its modular design and production, standardization and normalization of components and parts, development of specialized production of functional components of equipment of intersectoral application and so forth and improvement of production organization at enterprises.

It is no accident that the scientific and technical revolution materializes not only materially but also in the science of organization and management of production and of decision-making methods. This science is become a growth factor in the size and effectiveness of production.

A component part of organizational problems of development of production is organization of production management—planning, stimulation, cost accounting and so forth. They acquire an especially important meaning in socialist society. The June (1987) Plenum of the CPSU Central Committee examined and approved a detailed program of restructuring and improvement of processes of production management.

In machine building (especially in production and use of modern automation equipment), the role of production organization is important in two aspects. First, we have in mind the output of fundamentally new machines. It is not just a matter of **what equipment** is produced. In design it may correspond to leading models but still be significantly inferior to them in operation. It is important to take into account **how** it is produced and assembled—with functional components, modules created at highly specialized production facailities under conditions of high standards of machine building, with assembly equipped with assembling and monitoring-testing devices or under the conditions of a "subsistance economy." Basically new equipment in series suitable for use can be manufactured **only at a highly specialized production facility.**

Second, we are dealing with the process of operation of new equipment which would be effective only with carefully thought out organization of production. In order that automatons—machine tools with numerical control, robots, be able to normally function under unspecified conditions, they would need very complex and expensive equipment with "vision," a "sense of touch" and so on. Such a condition frequently holds back the use of automatons. Consequently, **wide-scale introduction of automation is ineffective if it is not preceded by a radical improvement of production organization.** This is confirmed by the practice of production and introduction of metal-cutting machine tools with numerical control and industrial programmed robots.

Clearly it should be determined more precisely with the participation of USSR Gosstandart what kind of technical device should be considered a "robot with programmed operation" and the technical characteristics of such rapidly produced (and only half purchased) robots looked into. The chief reasons for such a situation are that they are manufactured at enterprises of more than 20 ministries by a handicraft method and with unsatisfactory preparation of production organization at enterprises using them. As shown by surveys of the USSR State Committee for Statistics, downtime of robotized complexes is significantly greater than with ordinary equipment. Unfortunately, this also applies to flexible automated production operations. For this reason it is necessary to create a network of specialized enterprises for the production of components and modules so that modern automation equipment can be produced.

Scientific and technical policy should be accompanied by an adequate structured policy designed to provide priorities in development of sectors and production required for equipping scientific research and its materialization in appropriate means of production for introduction into sectors making end products. Accelerating development is required of electrical engineering, electronics and instrument making as well as of sectors of fine organic synthesis upgrading the technical level of many production sectors. Productive forces in the foreseeable future and a new stage of their development will be formed on such a basis.

Footnotes

1. In 1986, world production of steel amounted to 660 million tons, of cement—911 million tons, of sawn timber (excluding ties)—404 million tons and of synthetic resins and plastics—65 million tons.

2. The following data attest to the progress in this field. At the end of the'60s, semiconductor devices contained 5 logic circuits, by the middle of the'70s—100 circuits and at the present time— 1,500 circuits. At the same time, the number of bytes (information units) per semiconductor chip increased from 1,000 in 1970 to 256,000 in 1980, and it was supposed that by 1985 this number would grow to 1 million bytes. The cost of one byte (in cents of the United States) decreased from 0.1 in 1970 to 0.005 (twentyfold) in 1980, and it was supposed that by 1985 it would be reduced another 2.5-fold.

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Restructuring of Work of Material, Technical Supply Institute

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[Article under the rubric "The Horizons of Scientific Research": "Sectorial Science: Without the Right to Stagnation"; passages in italics are as published; first paragraph is MATERIALNO-TEKHNICHESKOYE SNABZHENIYE introduction]

[Text] A field meeting of the Collegium of the USSR State Committee for Material and Technical Supply was held in late August of this year. The question "On the Radical Restructuring of the Scientific, Scientific Organizational, and Financial and Economic Activity of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply in Light of the Decisions of the June (1987) CPSU Central Committee Plenum" was examined.

The All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply has a complex history. When the nucleus of the future research center was formed, there were no premises. Then they allocated a building, the collective began to be formed. At that time there were three or four candidates of sciences and only one doctor in it. The rest were young, "undegreed" lads. But how they worked! With what enthusiasm!

Councils of the national economy still existed, but they had already proposed the territorial principle of the organization of the statewide system of material and technical supply, which has also been in effect to this day. The USSR State Planning Committee developed, while within the walls of the institute, although not without difficulty and mistakes, the method of the long-term forecasting of the need for resources originated.

But today it will be a matter not of successes. The main institute of the sector is experiencing not the best times. Somewhere in the 1970's its collective and the sector were at a crossroad and chose different roads. Since that moment the picture has been changing radically—a prolonged and painful period of "inverse growth," which colored in sad tones the entire subsequent path of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, begins. The number of scientific developments increase, awards, certificates, and diplomas are presented, titles are conferred, but the term "a focus on petty topics" turns up more and more often in conversations. And although points of contact remain in individual areas, as a whole the distance between scientists and experienced workers is becoming more and more significant.

Even after the April (1985) CPSU Central Committee Plenum and the 27th party congress the climate within the walls of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply did not undergo substantial changes. Appeals "to intensify," "to increase" the efficiency of work and to strengthen the clean character of the scientist began to be heard more often. But these appeals and slogans were taken from yesterday and half measures could not eliminate the truly enormous gap between word and deed. That is why a detailed, honest conversation, with allowance made for the true services, but at the same time a demanding and principled conversation took place at the meeting of the Collegium of the USSR State Committee for Material and Technical Supply, which discussed the question of the radical restructuring of the work of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply.

In accordance with the results of the examination a decree was adopted. Its statement part is quite short—a little more than a page. Much more space is devoted to the forthcoming tasks. But these are capacious lines. What is behind them?

Noncoincidence

"...the scientific research institutes of the USSR State Committee for Material and Technical Supply are not conducting the necessary development in the area of the latest forms and methods of the organization of the material and technical supply of the national economy and are working with a low efficiency.

"This also fully applies to the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply as the main economic institute of the USSR State Committee for Material and

Technical Supply." (From Protocol No 19 of the meeting of the Collegium of the USSR State Committee for Material and Technical Supply)

Just recently they believed that the establishment of one scientific subdivision or another for some problem in many respects already solves the problem itself. And they forgot that they are dealing with a living organism. But like any organism, having been born, it develops, becomes firmly established, but then grows old. If a scientific research collective has not established its own, original direction in science, if it duplicates someone in something, decrepitude inevitably sets in.

Something of the sort also happened with our sectorial science. While conscientiously issuing elaborations on individual questions, suppliers, and economic regions, it did not prepare a general concept of the development of material and technical supply for the future. Meanwhile today the processes occurring in our economy are such that they require revolutionary decisions. Without this the new economic mechanism may remain a bare outline.

So that this would not happen, it is necessary to choose correctly the points of reference and to orient science not toward lagging, but toward leading. Indicators, which obviously surpass today, should serve as the ultimate goal of research and development. Only then will the new product, technology, and plan, which science suggests for introduction, meet the standards of an advanced economy.

Unfortunately, the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply in recent years, as a rule, has not set such tasks for itself and has directed attention toward the present possibilities of the sector, and not toward those which consumers actually need. Further as a consequence: the choice of the main directions of science suffered. At one time it seemed that they would attain leading levels. But the level drew near, and it turned out that here again there is a lag.

Scientists worked as always, but the dynamism of former years ceased to exist. But the whole point is that they worked as always, while the national economy and the sector became different. And whereas just yesterday we were content with the fact that consumers agreed without complaining to changes, which undermined their economy, and silently stood in line at the gates of supply enterprises, and at the end of the year for the funds instead of special rolled metal products it was possible to foist on them cast iron blanks, today cost accounting and self-support [samookupayemost] are making the same submissive applicants obstinate and inflexible.

The changeover from extensive to intensive methods of management revealed all this. What is new, advanced, and practicable was required. The attitude toward what science offers became envious and its insolvency immediately came to light. So it happens with a lake, which stubbornly does not freeze over, although the temperature of the water in it has dropped below zero. However, someone near by fired a shop, and ice instantaneously paralyzes the surface. In the sector, where unvoiced discontent with the state of affairs on the scientific front had built up for a long time, the word became the detonator. Let us give the floor to the participants in the meeting of the collegium.

From the Statements at the Meeting of the Collegium

Chairman of the USSR State Committee for Material and Technical Supply L.A. Voronin:

"We need to understand what to do further for the improvement of the work of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, because the major revolutionary change, which we are obliged to make in the system of material and technical supply, without our main institute will not occur....

"First of all the collective of the institute needs to change its psychology. If the management staff, which has gathered here, also pursues henceforth the policy of a focus on petty topics, without the detailed study of the vital questions of the material and technical supply of the national economy, without major basic decisions, we will not advance anything."

A.S. Yemelyanov, director of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply:

"...The institution also accomplished just as poorly its tasks in the area of the formation of the scientific specialization and reserve. But the primary thing is that its own platform, from which it is possible to pose questions both for directive organs and for the USSR State Committee for Material and Technical Supply, has not been developed. The point is not that there is no time to write, but that we often have nothing to write."

V.P. Yefimov, deputy director of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply:

"From the more than 300 works, which were completed by the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply on resource conservation during all the years of its existence and were completely, as a rule, in a skillful manner, it is impossible all the same to create an idea of how to manage resource conservation in the country. Especially now, when a new economic mechanism is being developed."

A.I. Baskin, deputy director of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply:

"We should reject a number of traditional appraisals and approach the formed economic situation from a new standpoint."

V.T. Tugov, chief of the Administration of the Organization and Improvement of Material and Technical Supply:

"The question, which has been submitted today for discussion by the collegium, in its significance is broader than simply the improvement of the work of the institute. In essence it is a matter of the scientific support of the restructuring of the material and technical supply of the national economy. And in the end a matter of the success of this restructuring."

If the question of the effectiveness of basic research were purely theoretically, it would be possible to console oneself with the fact that in other spheres of knowledge there are also problems, over which scientists have been sweating for decades. But economic practice, especially at the turning point of its development, cannot wait that long. Scientists must comprehend more rapidly that in the sphere of circulation and production now it is already impossible to accomplish much directly: if a thing is needed, plan the thing for enterprises.

The decree on the radical restructuring of the material and technical supply of the national economy was adopted quite recently. It is a most important document for the sector. Is it necessary to say that it was prepared not in 1 month and and to speak about the contribution, which scientists of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply could have made to its elaboration. They could have made, but did not. It is sad and a pity, but a fact remains a fact—at the decisive moment we did not have a scientific reserve. Not one constructive suggestion was voiced during its study. Neither positive nor negative. And not because the draft, which was submitted for discussion, did not have flaws. The point is that in the area of the economics and organization of material and technical supply as an object of scientific research there was no guiding force, which would have itself solved the problem and would have intensified, properly formulated, and raised its significance to the level which it actually has in economic practice.

In this connection it does not harm to explain why it turned out this way in this most important matter and that the "NIIMS" (the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply) sign existed, while behind it there was a vacuum.

Why are the associates working at it—not at all mediocrities and far from loafers—doing their job in such an uninspired manner and formally?

Incidentally, we will return again to the "why." Now we will investigate better with what they were busy this entire year. But for this it is necessary to leave for a while the hall of the meeting of the collegium.

Recently one of the staff members of our editorial board returned from a business trip to Volgograd. There, as usual, a discussion about the materials in the journal started. And, as usual, the complaints that the journal provides too few scientific articles, were voiced. But they are necessary. Just as, and forgive us for the hackneyed comparison, man needs air. One of those present noted that the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply and the editorial board are situated quite close by. Do they really not provide anything? They do. On how it is possible to save copper at one enterprise, and something else at another. On the fact that for the obtaining of materials through wholesale trade it is necessary to drive up in a motor vehicle, take an order, sit behind the wheel, beep the horn, and begin moving forward. On the fact that the instruction on wholesale trade, which was drawn up by the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, is not suitable for anything, and wholesale trade cannot be developed that way. (We are not against criticism, but having said "A," one must also say "B"—how it can be developed.) On what the norms of natural diminution are at the level of a reference book and how useful it is to save secondary resources. We do not published such articles. But we are also not closing the journal for associates of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply—for interesting articles appear from time to time and the editorial board does to withhold them. If there were more truly scientific materials, there would be more publications.

Not at all by chance is so much space devoted here to publications of workers of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply. At the collegium many spoke about the necessity of their increase. The sector does not want to and cannot live and develop without science. Individual developments of the the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply are yielding a real profit in practice and prove to be very, very efficient. A deep bow for this to their authors, Scientists with a capital "S." But for the most part science is stubbornly silent and will rarely voice a practical opinion—although also not without this—but most often it ends in long known truths. The scientific world does not know our sectorial science, because there is nothing to say to it. In order to prove this, let us cite another example. Incidentally, it was also cited at the meeting of the collegium.

Voronezh. A conference on a system of the simulation of production, distribution, and consumption on the basis of wholesale trade was held here. In all 20 scientists spoke. However, among them there was not one from the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply. Moreover, none of the speakers mentioned any developments or if only errors of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply.

One conclusion suggests itself—the scientific world does not know the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, since it can say hardly anything in science. In the past 1.5 years only 13 percent of the scientific associates of the institute have published their own materials, just 8.6 percent have delivered reports.

And still, since the institute exists, it should do something. It should and is. Moreover, it is laboring—at any rate a large portion of its associates—intensely. But here is another figure, which speaks about very much and gives an answer to a fundamental question: Why has a vacuum formed in sectorial science? About 36 percent of the documents, which the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply submits, are staff inquiries on various questions. The remainder is a small trifle. And at what is one to be amazed that the institute wins certificates and prizes? We have, after all, masses of examples, when a plant and an association stably fulfill the plans and...continuously rush toward a greater and greater lag. An inexpensive "verifier," which has been driven into the plan and program of research, does its job.

Half of 1 of the 300 works, which are being completed by the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply on resource conservation, is devoted to classifications of locks: padlocks, mortise locks, and so on. In order to conclude the theme, they gathered data and figures, processed them, and made a pamphlet—only scientific thought was not required here.

T.N. Dementyeva, chief of a division of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, cited at the meeting of the collegium another example of such scientific zeal, apparently without entirely understanding what she was doing. And not without resentment she concluded that the attitude toward the labor of the institute is incorrect. The essence of the matter lies in the following. At the beginning of this year the Moscow Main Territorial Administration of the USSR State Committee for Material and Technical Supply positively made a mess of the work on the development of wholesale trade. Associates of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply investigated for a long time and thoroughly the causes and in the end elaborated recommendations, which experienced workers accepted without proper respect.

But they gave it up as a bad job after a fight. If the workers of the main supply administration had been furnished with a real theory, and not instructions concerning the fact that they must get into a vehicle, release the brake, and turn the ignition key, perhaps, it would also not have been necessary to spend precious time on correcting the committed mistakes. For the associates of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply went to the Moscow Main Territorial Administration of the USSR State Committee for Material and Technical Supply to put out a fire that had been ignited by lightning, and not to disperse the clouds and to prevent lightning.

It is in that way that an enormous office, which subsists on minor scientific odd jobs and in which beneficial soil for the sprouting of failures, the loss of a sense of the front line, and scrambling to the periphery of problems was created, emerged in the sector actually due to budget allocations which were intended for in-depth research.

And a few more words about wholesale trade. The sector does not have another means of development. The customary forms of the disposal and distribution of means of social production have obviously become obsolete. They no longer ensure instantaneous reaction to the achievements of scientific and technical progress. For in order to produce, say, a new model of a motor vehicle, it is necessary at one enterprise to produce tires, at another to order components, and at a third to order rolled metal products.

Now years are being spent on this. For the present the improvement of the economic mechanism affects just to a small degree the relationship of possession and disposal. However you change the indicators of the evaluation and stimulation of the work of enterprises of industry and supply or the procedure of forming bonus funds and however you make it incumbent to use new equipment, practical management will not be the result.

The way out lies in wholesale trade. But having participated in childbirth, the the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply did not worry about the normal development of the child, who during this time turned into rickets. Today wholesale trade is experiencing rebirth. Only the danger of the repetition of the past mistake is also being maintained now, inasmuch as science thus far has not elaborated an integral concept of its development, while wandering in the dark will not lead to good.

Incidentally, about darkness. In the capital of Burkin Faso from time to time noise and a crash disrupt the night silence. Empty pales, cans, and bottles set into motion. It is residents scaring...a big black cat. According to local superstitions, at times it climbs into the sky and grabs the moon. That is how a lunar eclipse was explained from time immemorial.

Of course, now hardly any of the residents of Burkin Faso believe in the black cat. They scare it out of tradition. But why did the bad tradition of advancing by groping appear at some time in our supply? Why did the lamp of science suddenly go out? Why, instead of moving confidently in the light, should we make noise and drive away the "black cat" of the unknown? The next page of the report is about this.

The Anatomy of the Decline

"The All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply did not take a leading role in the matter of the coordination of research and the procedural and organizational supervision of the development, which was being conducted by scientific and educational organizations of the country in the area of the improvement of the material and technical supply of the national economy." (From Protocol No 19 of the meeting of the Collegium of the USSR State Committee for Material and Technical Supply)

When you add up all the waste and losses, which occur due to the fact that science was in the rear of practice, a question automatically arises: Who was the first to throw the stone which caused the avalanche, what circumstances played their fatal role?

Many participants in the meeting of the collegium asked this question. But not to find the "extreme." Of course, many people and circumstances of both an objective and a subjective order are to blame for what happened. And still let us go through the chain backward.

Houses, just as people, have their own character. The building of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply is not an exception. Half of its facade is painted, while half is not. They made the repair long ago and the new paint has already had time to grow old and in places has peeled off. Thus the building, which has as if been touched up with rouge and at the same time has deep wrinkles, has also stood all these years. Within permanent repair is also under way: they change the furniture and paint the walls. But it is also never completed: first the linoleum will pull up, then garbage will pile up in corners. Thus the foppish woman, having put on a thick layer of cosmetics, at times forgets to clean the dirt from under her nails.

Makeup in the life of the collective of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply played not the best role. Begin with the fact that its miscalculations for a long time were concealed. However, let us cite a the quite eloquent testimony of the discussion participants.

From the Statements at the Meeting of the Collegium

V.T. Tugov, chief of the Administration of the Organization and Improvement of Material and Technical Supply:

"The former management of the Scientific and Technical Management, which perceived all criticism meant for the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply as an attempt to doubt the efficiency of the administration itself, also did the institute a bad service."

Some game of give-away at a high level for the sector was under way, when the loss suited both parties: institute researchers, who dealt with a trifle at hand and duly received rewards for this, and their main clients, from whom it was merely required to spend the sum planned for "science." It must be assumed that it is not worth speaking of any serious influence of such cooperation on the overall level of research—vigorous young growth will hardly appear on a field, which has been fertilized somehow or other and has been sown with bits.

Of course, it is a reliable defense. Not by chance for many years were petty reproaches at worst and simply not a demanding and exacting analysis of its activity heard in address of the institute even from the rostrum of party meetings. Criticism that was in any way serious was qualified as an attempt to wash dirty linen in public. How can one not recall here that the strength and wisdom of Hercules were also required in order to clean the Augean stables.

But it would be unjust to dump everything indiscriminately on high patronage and the "most favored treatment" for the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply. A number of other objective causes also existed. The monopoly status of the institute in the sector, which precluded any competition of ideas, had an effect. The financing of the institution, and not scientific work, as genuine cost accounting requires, fed "science" without any accountability for the results of labor. And hence, too, the return: work at times reduced to attendance to the immediate needs of the management staff. We have already cited the figures.

The outwardly appealing, but in practice faulty aspiration of every administration of the USSR State Committee for Material and Technical Supply to have within the institute "its own" subdivision led to serious consequences. It disunited the scientific forces. In 10 years the

number of subdivisions at the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply increased by 1.5-fold, while the number of specialists working in them decreased. Such a collective is no longer capable of serious development.

Another cause, more precisely a consequence of the preceding one, is that fact that the sectorial workers saw in the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply just one of the subdivisions of the central staff and included it in all and any jobs, with which they were quite capable of coping independently. Hence the increase of the number of documents and assignments. And with each year their volume increased relentlessly.

From the Statements at the Meeting of the Collegium

A.S. Yemelyanov, director of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply:

"In addition to our plan there are tens, hundreds of documents, in which assignments for the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply are recorded. However, it is not always justified to enlist the institute in all developments."

In 1977, 355 documents a year were issued on questions of science in the sector. Now nearly 1,500 of them are being issued. But the truth is well known: when people are buried in chores, they get out of the mood for basic research. Such is the punishment for an avalanche of instructions.

Finally, it is impossible to not speak about another fundamental thing. It is indisputable that today the national economic saving, and nothing else, should determine the direction of our efforts. The coordinator and organizer of this work—the USSR State Committee for Material and Technical Supply—knows this better than anyone. However, the principle "the maximum impact with the minimum expenditures," by which people were guided when it was a question of the capital-labor ratio of scientists, led not to a gain, but to a loss. From such a "saving" the time of development increased unjustifiably and its quality suffered. Expenditures should be not minimal, but efficient. At industrial firms of economically developed countries of the world the cost of a workplace of a research is hundreds of thousands of dollars. But what is the capital-labor ratio of our scientists? A desk, a chair, one calculator per sector, and a computer center for an institute. In order to duplicate an urgent article, it is necessary to stand through a long line.

Given such a noncoincidence of interests, of course, the horse of science simply does not want to move smoothly under the rider of the sector. And it even does not wish to follow on his bridle.

But still not these, without a doubt, profound and objective circumstances served as the first stimulus to the decline. The collective of the institute had fallen seriously ill. And this disease was more frightening for science than AIDS.

Approximately once a quarter—now is not the time to establish why not more rarely and not more often—M.V. Solodkov, the former director of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, walked round the entire building of the institute. Methodically, floor by floor. He was in general a sociable and cheerful person, but during the rounds smiled very rarely. Probably because it was much more difficult not to lie to himself than to lie to others. Outwardly everything was as always: on the staircases associates were taking a smoke break and conversed animately, someone was hurrying somewhere, the tapping of typewriters and telephone rings were heard from offices. But he, Solodkov, knew better than anyone that hardly anything was behind the appearance of vigorous activity, the institute out of inertia was making half-idle turns. And in the fact that this once hardy and strong organism had now waned, there was no small share of blame of his, Doctor of Economic Sciences Solodkov. The institute had forgotten how to work and although the director, as before, held firmly in his fist all the threads of management, feedback more and more often did not work.

Mikhail Vasilyevich on coming to the institute did not long for the heights of sectorial science and the solution of basic problems and did not intend to be a genius. He assigned himself the more modest role rather of an administrator than a scientist. It did not disgust him when he saw the same innate qualities in subordinates and did not have an aversion to surrounding himself with "kindred souls." In a word, he held his ground, as they would later say at the collegium, by the fact that he "was as if a quite good person." Like a current through wires, the scientific passivity of management was transmitted to nearly all the units of the institute. However, one should not exaggerate the significance of the personality of the former director in the history of the institute.

From the Statements at the Meeting of the Collegium

A.I. Selivanov, chief of the Economic Administration:

"The reasons for the degeneration of the institute seem simple to me: the people, who had begun work here, raised a number of important questions and were satisfied—there is a candidate degree, it is also possible to slow the pace, it is possible to relax."

Among a certain portion—and not a small one—of the collective of the institute a type of scientist, who avoids research themes, is incapable of daring and taking risks, but has a developed economic aptitude and is content with trivial results, formed. A person of such a mold does not develop revolutionary technology—he will perpetually improve and supplement old technology. He also breaks others of the habit of thinking, searching, and assuming responsibility. Such a psychology stands in the way of progress. Mutual protection, corporate groups, and groups of dabblers, who obstinately defend old, customary directions, even if their lack of promise and insolvency are obvious, also emerge precisely in such collectives. And here is clear confirmation of that.

At one of the sections of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, which discussed questions of the development of wholesale trade, the speaker asserted that under the conditions of socialism wholesale trade cannot exist at all. And that is that, no more and no less—it cannot be and that is that! More than 20 years ago scientists actually made an issue out of it: Is there or is there not to be wholesale trade? And they decided unequivocally—there is! It existed poorly all these years. And then suddenly: the bogy of the lack of faith in the possibility of the very existence of wholesale trade, which had been laid to rest long ago, it would seem, is reborn. Very well, something new was heard. It is not prohibited and is even useful to doubt, to seek, and to make mistakes in science. Yes, yes, even mistakes, it turns out, are beneficial. Dogmatism, when moss-covered truths, which long ago compromised themselves, are drawn into the world and are passed off as an innovative approach, while inferences like "This cannot be, because it never can be" are adopted, is useless. From such a standpoint in 4-5 years, as the party requires, you will not make wholesale trade the basic form of the supply of the national economy with material resources. They cited this example at the meeting of the collegium. Unfortunately, it has analogs.

Not that long ago the editorial board jointly with the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply held a round table (it is possible to read the report in MATERIALNO-TEKHNICHESKOYE SNABZHENIYE, No 1, 1988). The theme was the problems of the formation of an anti-expenditure mechanism. The participants were scientists of various sectors of the national economy, higher educational institutions, and scientific research institutes. A big discussion over this far from well-defined and extraordinary problem took place. It went on until they shared opinions, but they did not dictate who is to do what and how and did not discuss with the transition to individuals who is right and who is to blame. Two associates of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply assumed the role of arbitrators. They listened to them in silence, because the truth emerges in a dispute, and not in injunctions and admonitions.

However paradoxical, the idea in our materialistic consciousness under the conditions of the inertia of scientific thought acquired a self-sufficing, material significance. Most often it appears among experienced workers (let us recall the experience of the Moscow City Association for the Supply and Marketing of Metal Products, the Volga-Vyatka Administration of the Supply and Marketing of Electric Machines, and many others) and at once begins to be rapidly introduced. But then it is found, rather it is recalled, that a scientific foundation has not been built under it, that it is founded only on a strong-willed and organizing basis. As a result scientists must not contend with the idea, not check its effectiveness, but namely substantiate and confirm its correctness, that is, follow two steps behind practice.

Here, strictly speak, there is also nothing to be amazed at. The train has already left, the idea is on stream, it is too late to have doubts. But the habit of relying on strong-willed principles not only destroys the independence and freedom of science, it deprives it of its main purpose: the gift of foresight. As a result it turns out that it is not science that nourishes the management of the sector, while practice reforms sectorial science, turning it into a continuation of the administrative apparatus.

However, the metamorphoses do not end with this. A scientist, who does not wish to plunge himself into the depth of scientific research, as a rule, explains his insolvency not by helplessness—a lofty sense of responsibility, which ostensibly disciplines him. This is a very convenient stand. Who will sort out what there is more of here: assiduity or demagogy?

The party organization of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, which has greatly thinned out in recent years, also was not ready to conquer the steep peaks which were raised by restructuring. The diagnosis may seem offensive: scientific atrophy and social shirking, but one will not find, without having been cunning, another explanation of the degeneration of the collective.

Biases in personnel policy made a considerable contribution to the troubles of the institute.

From the Statements at the Meeting of the Collegium

A.N. Nikolayev, chief of the Personnel Administration:

"The former director of the institute groundlessly got carried away with inviting scientific associates from other institutes and organizations. Moreover, subjective approaches frequently made themselves felt. This led to stagnation in the advancement of young people, who, not having sensed attention to themselves, left very quickly. As a result in 10 years the proportion of young associates declined by 13 percent."

At the institute there was a practice, when the chief of the personnel division found out about the hiring of one or another worker last of all. The chiefs of the functional divisions hired associates with the permission of the deputy directors or the director himself. Hence the subjectivism in the selection of personnel, hence the emphasis not on business, but on welcome people and groups. Personnel policy lost its meaning and turned into personnel games, which were played without any rules, in evasion of moral norms and the law. But a position is not a type of reward and not an expensive gift, which is presented to the chosen ones for personal devotion and services. Any such "gift" is a bribe, which a superior does not take, but gives.

Today in the statistics division of the 26 scientific associates only 15 have an education in the specialization. The situation is not much better in other divisions, where it is possible to encounter educators, historians, and even a midwife in the position of economist. Several workers in recent times have changed several times the direction of their work, but this is not conducive to the in-depth study of the state of affairs in the sector.

The consequences of such a personnel "policy" were not slow in showing and are having an echo to this day: A.S. Yemelyanov, who was recently appointed director of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, and the new associates sensed very keenly how short the bench of reservists—the bench of the personnel reserve—was and how poorly the reserve was trained at times.

All these facts are also leading to more generalized reflections on what harm nonscientific methods of work in science are turning into for us. And another thing: it would be incorrect if in accordance with these facts the opinion forms that the entire collective of the institute is equally indifferent to the fates of sectorial science. No. Many names of associates of the institute, who are actively working and are taking a most direct and lively part in the search for the optimum solutions for practice, were heard at the collegium. And in the world there are not that few sensible and honest people, who are capable of hearing you and understanding. But it is not they who led behind themselves the collective, which, while advocating restructuring in words, in deed was afraid to speak out against those who helped the institute to slide down. The fear for one's own "I" overshadowed the common "we."

Antoine de Saint-Exupery once said: "In order to be, one must assume responsibility." The institute should assume all the responsibility for the state of sectorial science and for the scientific base of the reforms being implemented in the national economy.

Revelations and Omissions

"To regard as the main task of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply the formulation and improvement of the scientific concept and mechanism of the material and technical supply of social production under the conditions of the development of full cost accounting and an integral system of the management of the national economy...." (From Protocol No 19 of the meeting of the Collegium of the USSR State Committee for Material and Technical Supply)

Perhaps, no question of the life of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply remained outside the field of view of the meeting of the Collegium of the USSR State Committee for Material and Technical Supply, in the shadow. The conference participants approached each of them with a measure of great responsibility and practical strictness. The workers of the institute received in the form of a protocol a specific and comprehensive program of the restructuring of their activity. A general assembly, at which the results of the work of the field Collegium of the USSR State Committee for Material and Technical Supply were related without concealment and embellishment and a detailed decree was adopted, was held several weeks later.

It would seem that everything necessary for the achievement of positive results and the progressive development of sectorial science was done. And that is why I would like to conclude these notes in a major key: to say that restructuring at the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply is picking up speed, the people perceived the criticism in a practical manner, the corresponding measures were formulated, and before scientists brilliant horizons and great deeds for the glory of themselves and for the benefit of sectorial science are opening.

Yes, restructuring began. Yes, the collegium shook the collective from top to bottom and forced everyone to think about the future scientific resources. Yes, the corresponding measures were carefully thought out, weighed, and introduced. Yes, great prospects are indeed ahead. All these are objective and gratifying facts. Only the symphony of life also contains minor sounds and the results of the work of the collegium do not keep within the channel of single, clear definitions.

And, therefore, let us delay over the future. We will still get to it. It is necessary to look more closely and over and over again at the result of the past—the present. To look at it and to evaluate it with all objectivity. Not only for the benefit of the collective which has newly taken the helm of management. For the sake of the truth. Today half words, half speeches, and half truths are just as dangerous as half deeds. Without knowing the exact diagnosis, it is possible to make an erroneous decision. A temperature, whether from a light cold or from tuberculosis, is the same. The outcome is different. Therefore, it is also necessary to examine from what "today" scientists intend to step into "tomorrow," while planning the radical restructuring of the activity of the institute.

First of all the identical notes and evaluations of the state of the collective attract attention. In the opinion of all the associates without exception of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, who spoke, it "is filled with the desire to work and is capable of much." Deputy director V.P. Yefimov and division chief Ye.P. Belotelov did not take the same path, but followed in each others tracks, when they gave assurances that "at the institute there are genuine specialists, who are capable of accomplishing the most difficult tasks on the restructuring of material and technical supply under the conditions of the new economic mechanism." Other speakers, including A.S. Yemelyanov, the new director of the institute, echoed them. But deputy director A.I. Baskin made as if to strike a bigger thing: he undertook to prove that both in past years and now the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply has been experiencing unearthly strains. He used figures, diagrams, and comparisons with the United States. He did not prove it, because it is difficult to prove the unprovable, what does not exist.

It is commendable, of course, that the management of the institute is unanimous in the belief in the potentials of the collective and that it is setting itself great tasks. But say what you like, still behind these in general not very original accomplishments there is not a shadow, but the clear outline of the aspiration to protect oneself against all kinds to surprises and to get a little more of an advance for the future. Let us listen attentively: "there are genuine specialists," "capable of accomplishing the most difficult tasks"....

It sounds! Only it is a strange thing: for every thesis in this history there is an antithesis.

Genuine specialists—but a sector without a theoretical base.

A sector without a theory—but the ardent desire to work.

The desire to work—but the lack of results.

The lack of results—but a good prospect.

Where is the line, beyond which word merges with deed?

From the Statements at the Meeting of the Collegium

First Deputy Chairman of the USSR State Committee for Material and Technical Supply V.A. Faustov:

"I am a man from a working collective, in which people have become accustomed to calling a spade a spade. First of all the morbid perception of the criticism, which was voiced by workers of the USSR State Committee for Material and Technical Supply, struck me. How would you perceive criticism on the part of your subordinates? "I met with the deputy director. Not what has not been done—it is possible to correct this, but the fact that the managers are convinced: in their own directions they are doing more than is needed, alarms me."

The position of A.S. Yemelyanov, the new director of the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, when he did not begin to divide the mistakes into his own and others' and into ones committed before him and under him, is understandable and humanly appealing. In the 3-4 months, during which he had directed the institute, you would not correct the old, you would not have time to commit new serious blunders. But all the same he always said "we," with respect to both the future and the past. But here, too, the assertion that the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply is doing more than other sectorial institutes conveyed a sharp dissonant note.

The capacity of rivers for self-purification is well known. A mandatory condition of this process is movement. From small to large. One must not stand still and flatter oneself with what has been achieved. To motion to those who are worse instead of becoming equal with those who are better is not a better position.

At the meeting of the collegium the references of other management staff members to individual achievements, which had occurred in the past, and to the fact that now they are as if being underestimated, and hence, the incorrect attitude of the management of the USSR State Committee for Material and Technical Supply and a one-sided approach, sounded even more strange.

Concerning the attitude let us say just one thing: it formed not today. It was much earlier. At the time when the sector was waiting for a comprehensive theory of its development, but received only partial solutions. At the time when at the meetings of the party and economic aktiv every other speaker voiced grievances against the institute, while the secretary of its party organization, without hearing anyone and anything, threw figures and facts of pseudo-achievements into the hall like stones from a sling. It was then, and not now. Now only the bitter fruits of overconfidence are being reaped.

There were also successes. This is true. But no one is disputing them. This has already been spoken about here, therefore, we will not repeat ourselves. And all the more so no one is about to resort in the evaluation of the work of the institute to primitive, like a gun hammer, "binary" tactics: good—bad, friend—enemy, yes—no. One must not depict the processes, which are occurring at the All-Union Scientific Research Institute of the Economics and Organization of Material and Technical Supply, only in black and white. This is a mass of half tones here. The collegium also approached precisely that way.

From the Statements at the Meeting of the Collegium

Chairman of the USSR State Committee for Material and Technical Supply L.A. Voronin:

"We came here to do together with you everything possible so that the institute would get on its feet and would have the authority, which it is obliged to have, so that it would be the arbiter of fashion in the area of material and technical supply."

And another revelation. It is understandable that, when in general terms the conversation at the collegium came to the collective of the institute, it received far from a clear evaluation. The majority approved of and supported the adopted decisions. But there was also the following opinion—it is necessary to reduce criticism and especially specific criticism, with names,by 80 percent, then everything will be correct. And that is that, no more and no less, without faces and names. Tickling, and not beating criticism is needed. Thus, the inertia, against which all of us together are attempting to revolt, is appearing in the very surmounting of inertia. In the fact that the sweeping away of old barriers is proposed somewhere there, on the side, at least in the neighboring house, only not in one's own house, not in oneself.

As we see, the discussion at the collegium was intense and polemical, at times even rigorous. But this is far more useful than complaisant "unanimity." Even though different points of view on something appeared. This cannot frighten. Not by chance are we calling restructuring revolutionary.

Such events are not quickly smoothed over in the memory of people and, therefore, it is necessary that lessons—even though bitter ones, yet ones which do the cause good—would be learned from them.

Today the institute is living as if in two dimensions: yesterday and tomorrow. A good specific program of organizational measures on the radical restructuring of activity has been outlined at it. It has already started. The changes for the better are pleasing.

Now it is necessary to see to it that they would become irreversible. But we will return again to the discussion on the extent to which it will be possible to implement what has been outlined.

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State Acceptance Organ Described

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[Article by B.S. Migachev, chief, State Acceptance Administration, USSR Gosstandart: "On the First Steps in the Creation of Organs for the State Acceptance of Products"]

[Text] Under present conditions a radical improvement in product quality is a key economic and social task for realizing the 27th CPSU Congress program to accelerate the country's social and economic development.

Product quality is a very important factor in intensifying the economy to more completely satisfy the growing demands of the national economy and the population.

As is known, all industrial products in our country are produced only according to state standards or technical conditions, which contain qualitative indicators for industrial product quality. The extent to which production operations observe standards and technical conditions determines industrial product quality.

In recent years there have been more instances of industrial enterprises violating the requirements of normative-technical documentation (NTD) for products.

State inspections of standard and technical condition observation in recent years show that in 70 percent of the cases products deviate from NTD requirements. It should be kept in mind that the products which violated these requirements had the OTK [Technical Inspection Department] stamp, that is, they were inspected by the official plant control service.

These facts are evidence that departmental technical control services had a direct interest in fulfilling the production plan "at any price", because material incentives for OTK workers depended upon this.

Therefore, it became necessary to create an objective and reliable barrier to defective goods, a barrier which would reflect the genuine interests of the national economy and the population. The CPSU Central Committee and USSR Council of Ministers decree "On Merasures to Radically Improve Product Quality" created an organ for the extradepartmental constol of industrial product quality—State Acceptance. In the name of the state this organ is called upon to assist in increasing the responsibility for quality at each section in the entire production cycle and to improve the manufacture of components and final products.

Organically connected into the general feedback system for managing product quality, state acceptance, in discovering shortcomings in final products, finds both the subjective and objective reasons for defects. These can be either violations of manufacturing processes by the

manufacture, or low technical standards of production equipment, which cannot meet the given manufacturing conditions. In this case state acceptance stops accepting the products and forces to enterprise to take immediate measures to eliminate the reasons for the defects. When, as a result of the measures taken, the product meets requirements state acceptance resumes its activities.

Thus, the strategy for accelerated social and economic development worked out in our country and based upon scientific-technical progress, the large scale reconstruction of the entire national economy and a central role for quality control in economic policy made it necessary to introduce state acceptance directed towards rapid improvement in product quality and raising it to world levels. This requires the production automation, the introduction of the latest technological processes, incentives for accelerated renewal of fixed productive capital, reconstruction and the certification of jobs and the creation of the newest testing and control-measurement equipment.

In the production process state acceptance directly monitors all quality assurance work at industrial enterprises, accepts products at any stage of manufacture, checks to see if they meet NTD requirements, conducts selective checks, disassembly and testing of components and parts and finally accepts products.

State acceptance begins with the initial inspection of parts. Although the quality of parts and all materials is directly inspected by OKT, state acceptance monitors the OTK itself at this stage of production, using the method of "flying" inspection. Here part quality acquires special importance in order to prevent nonstandard parts (and raw and other materials) from entering production and to have definite quality guarantees in the production process. Another, equally important task is claims work—the analysis of defects in incoming parts and determining the manufacturer of defective products. If the plant delivering the defective item is discovered state acceptance quickly establishes direct communication with the state acceptance unit at this plant (if it has one) or the territorial organ of USSR Gosstandard for that plant and informs it of the unsatisfactory quality of the product sold by this plant so that it can take the measures necessary to eliminate such defects. Thus, state acceptance information on the unsatisfactory quality of final products quickly brings into action the entire system of state control throughout the entire production chain: from raw material to finished product. Herein lies the dynamism and effectiveness of state acceptance.

State acceptance gives special attention to enterprise design documentation meeting the requirements of normative documentation (GOST's, OST's [sector standards] and TU's [technical conditions]. It is essential that design documentation quickly reflect all changes in normative documentation and that corrections be made in the former following results from delivery or periodic control testing.

When corrections are made in design documentation it is necessary to make appropriate changes in all technological documentation.

Among the main reasons for defective finished items is the failure to observe normed manufacturing processes. There can be various reasons for this: the manufacturer's lack of preparedness or discipline, poor technological documentation, uneven production, etc. State acceptance is obligated to discover all specific reasons for defects in production and, jointly with engineering services, to work out measures for their elimination and then, implementing these measures, to put an end to shortcomings and defects and renew acceptance.

In evaluating the quality of final products, state acceptance should have a reliable mechanism which would objectively establish the correspondence of actual characteristics or parameters to the requirements in NTD. Delivery and periodic control or standard testing is such a means. Its results, in the form of a protocol, makes possible a numerical comparison of parts specific qualitative indicators with the norms. The unity of the testing process is assured by OTK and state acceptance using the same normative document (GOST or TU) during testing.

In evaluating the results from periodic control testing, state acceptance accentuates it attention on the main qualitative indicators most important to the customer's initial interest: reliability, service life and esign. An important role in the objectivity and completeness of testing is played by control-measurement sets, which must be metrologically certified beforehand. Only then can quantitative results from testing be reliable.

Metrological support is very important not only for testing, but also for manufacturing processes. It is here that measurement, making it possible to analyze the course of a manufacturing process, to manage it, especially after receiving signals showing the divergence of qualitative indicators, assures the strict correspondence of conditions to the requirements of technical documentation.

The condition of work places should also be within the competence of state acceptance. The work place must have the required set of documentation covering the manufacturing process or control operation. The work place is provided with the needed measuring equipment, which has undergone obligatory metrological testing and is suitable for its work. In general, this certification should assure both the qualitative performance of the manufacturing processes and the quality of the item produced.

In accepting finished products after they have been approved by an OTK, state acceptance is thereby directly monitoring OTK activities. This makes it possible to determine the efficiency of the enterprise's work

on improving product quality and, especially those of the OTK as a part of an industrial enterprise obligated to halt the production of low quality products.

In the initial stages of its activities state acceptance should help strengthen OTK functions and improve its work efficiency. State acceptance should look at staffing at the OTK, its supplies of monitoring-measurement tools, incentives to enterprise control-inspection services as determined by Party and Government decrees.

Such is the basic structure of state acceptance of products.

State standards define four cases where product approval can be halted by state acceptance organs.

1. **Product does not meet NTD requirements.** This can be discovered by comparing requirements in GOST's, TU's and OST's with specific technical or economic indicators contained in official technical documents for final products.

2. **Negative results from testing.** During delivery, periodic checking or standard testing it might be discovered that one or several indicators to not meet NTD requirements. If, upon analyzing the defect, it is shown to be random, or quickly correctable, then after it is corrected state acceptance resumes accepting it.

If the deviation from the NTD is determined to be a shortcoming of design documentation or the persistent failure to follow manufacturing process rules because of the limited possibilities of equipment, the organ of state acceptance does not resume approval until either the design shortcoming is eliminated or there are changes in the manufacturing process to assure that the product strictly meets NTD requirements.

Thus, state acceptance, influencing specific elements in production, impels them to observe the required production and technological discipline, which is basic to observing requirements in normative-technical, design and technological discipline.

3.**Repeated violations of manufacturing processes** which lead to unstable production and, consequently, to unstable product quality. State acceptance, determining the so-called "pain threshold" in a manufacturing process, that is, when it has a substantial influence upon a product's final quality, can either set up acceptance by operation, or acceptance of individual components or units after their acceptance by the plant technical control service. Such actions by state acceptance make more reliable the evaluation of finishing operation quality.

4. **Defects causing accidents (breakdowns) which are discovered after the product is put in to use** if such defects are also found in products in the production process. This situation is primarily due to shortcomings in design or the failure to observe manufacturing rules. The product's operational reliability or its safety features are reduced.

Any situation involving the curtailment of product acceptance should be analyzed. This analysis should first discover the reasons the product deviated from specific parameters or properties in the NTD. If these reasons are easily and quickly eliminated from the production process then the product's approval resumes after subsequent checking.

If the defects revealed are of a permanent nature and their elimination requires technological improvements, modernization of machine tools, reconstruction of buildings or other work, which will take time, then the enterprise and the ministries work out measures to eliminate the reasons for the defective items and implement them so that finally a product is produced which meets requirements. Until then production will not strictly meet NTD requirements.

In exceptional cases, determined by economic necessity and advisability, USSR Gosstandart, the manufacturing ministry and the client ministry (customer) can decide to temporarily deviate from an NTD. The manufacturing ministry should guarantee the defect's elimination and the product's improvement to fully met the NTD.

If a product is sold which temporarily deviates from an NTD, all economic factors are applied to it: rebates on the main price, penalties, removal of the State Mark of Quality, etc. In accepting the product, state acceptance includes a protocol on such temporary deviation and monitors the implementation of enterprise and ministry measures to eliminate production shortcomings.

In their decree on measures to radically improve product quality, the CPSU Central Committee and the USSR Council of Ministers specified the date for introducing state acceptance—1 January 1987. In order to prepare for introducing state acceptance, USSR Gosstandart proposed the step by step development of the process: by October 1987 acceptance of 10-15 percent of total output, by November, up to 30 percent, by December 1987 at least 70 percent.

Any service's readiness for work is determined above all by the availability of qualified personnel and equipment to handle the tasks it faces.

By November 1986 practically all state acceptance units had been staffed with managers and by December of that year almost all staffing was complete. All managers underwent special training in methods and forms of state acceptance given at USSR Gosstandart institutes. All such managers have a higher technical education and experience in engineering and management work. Prior to their transfer to USSR Gosstandart most of them

worked at the same enterprises, thus there were no particular difficulties in the introduction of these specialists into an operation they knew, but in which they had new functions.

However, there was the problem that workers who had previously defended the interests only of their enterprise had to reorient themselves and become objective representitives of state acceptance, defending the interests of consumers and the state, interests which could possibly deviate from those of production. A state acceptance representitive should be, on the one hand, a direct participant in producing high quality products and, on the other, a strong barrier against defective goods. His principle: the plan—but only with high quality products and not at any price.

There is day to day communication with all 1,500 state acceptance organs. During January-Februrary 1988 an automated information system for state acceptance will be put in operation. It will be structured by ministry, region, type of product, etc. This will help in thoroughly analyzing products and in evaluating the efficiency of state acceptance.

11574

Economics and Management of Innovation

18140202 Moscow PLANOVOYE KHOZYAYSTVO in Russian No 12, Dec 87 pp 64-68

[Article by A. Solovev, candidate of Economic Sciences: "Economic and Organizational Conditions for the Introduction of New Technology into Production"]

[Text] **Reasons for negative tendencies in the development of sectoral science * Possibles of perestroyka in scientific organizations * Managing the efficiency of scientific-technical activities * Changes in economic relationships between NII and superior organs**

The acceleration of scientific and technical progress is a decisive prerequisite for implementing the 17th CPSU Congress program to transform productive forces and production relations in the country. The national economy's conversion to intensive social economic development requires strengthening the ties between science and production, first of all the organizational forms and work methods of scientific organizations.

Scientific and technical measures are being implemented in two spheres of the national-economic complex (in science and production). Therefore, the actual acceleration of scientific and technical progress requires creating objective conditions not only in production, but also in scientific organizations. However, in spite of the fact that much has been done to improve the economic management mechanism at scientific organizations and institutions, many important questions remain unsolved: the efficient use of scientific and technical potentials, the integration of various sectors of science, etc. The practical aspects of the formation of a scientific reserve, the depth of research and the posing of fundamental scientific problems lag behind long term requirements. The economic efficiency of basically new developments is only slowly increasing

Sectoral science must convert basic ideas into specific scientific and technical developments which are of practical importance and are usable in production. Therefore, the specifics of sectoral science organizations' activities not only involve a thorough study of the basic scientific and technical reserve, but also reliable knowledge of long term and current technical requirements in all spheres of pubic production. Such specifics also create development difficulties for sectoral scientific organizations.

Until recently sectoral science developed exclusively by extensive methods: when new scientific tasks arose, additional resources and limits on staff were granted; once in a while new scientific-research institutes or design offices were created. As a result, in the past 15 years the number of scientific workers in industry has increased by two-thirds. Financial expenditures at scientific organizations are growing at even faster rates; more than 30 billion rubles annually for science and science services.

Research and development work volume is growing together with the increased number of institutes and workers engaged in scientific activities. There was an especially sharp increase after the conversion of scientific organizations to new conditions for their planning, financing and incentives. More than 200,000 research and developments done by organizations and institutions in sectoral science and scientific services are registered annually. **What are the economic and scientific and technical results from scientific research institutes attained through these rapidly increasing indicators?**

In recent five-year plans average the annual number of new pieces of equipment introduced declined steadily and in 1985 was less than 3,500, or 25 percent less than 25 years ago. Development and introduction expenses per scientific and technical measure introduced into production continually increased (11,800 rubles in the 9th Five-Year Plan; 12,300 rubles in the 10th and 14,000 rubles in the 11th). Expenses per each new technical item increased even more rapidly (1.5 million rubles in the 10th Five-Year Plan; 3 million rubles in the 10th and 3.3 million in the 11th).

As is known, one of the basic indicators for overall results in science and scientific and technical progress is the number of workers released through the introduction of new technical measures. This hardly exceeds 500,000 workers for the entire national economy and has only been growing slowly in recent years. It costs the national

economy almost 25,000 rubles per worker released. If one compares the number of measures introduced and the number of workers released, it turns out that each of the latter requires almost two new technical measures. Such small and inefficient measures will hardly succeed in sharply accelerating technical progress in production.

These economic indicators for scientific organization activities are supplemented by poor scientific and technical results and very insignificant influence upon the main production indicators in sectors. It took 10 years to increase the share of machine building output with the highest quality category to 39.2 percent of total production. At this rate how many years will it take to increase this indicator to the level the 27th CPSU Congress set for 1990?

The technical level of developments in basic machine building is especially behind. Most types of equipment produced by the following ministries prior to 1986 did not meet highest world standards : the Machine Tool and Tool Building Industry, the Electrical Equipment Industry, Machine Building for the Light and Food Industries and Household Appliances.

The Basic Directions for the Economic and Social Development of the USSR during 1986-1990 and the Period up until 2000 provide for a 3-4 fold reduction in the time required to renew machine building output (that is, decreasing it from 30 to 7 years). However, until then, this much time will be required just for research and development work. By the end of the current five year plan 90-95 percent of series produced products and all newly developed equipment should meet better world standards. So far less then 10 percent of completed research and development done by sectoral scientific organization has technical and economic parameters exceeding present world levels. Developments based on the use of inventions acount for less than one third of NIOKR [Scientific research and planning design work] and is declining. Statistics show that there are serious difficulties in the wide scale use of scientific and technical achievements. Eighty five percent of inventions introduced are used only at one enterprise and only 0.5 percent at 3-5 enterprises. This is evidence not only that scientific organization activities have poor techno-economic results, but that the potentials created by scientific thought are very unsatisfactorily utilized.

What must be done to radically overcome the negative tendencies in sectoral scientific organizations and to break up the mechanism retarding science? First of all, it is important to determine the reasons hindering the effective functioning of science and technology, and the factors which make science more intensive under present conditions. This will permit a formulation of the basic features in the new organizational-economic mechanism replacing the old one.

It appears that the following are the main reasons for negative tendencies in the development of contemporary science:

State budgeted financing which has practically no linkage to results from scientific organizations. Even the use of EFRNT [Possibly: Economics and financing of scientific and technical work] with weak cost accounting tools in science is actually a form of state budget financing.

Ministries and agencies do not bear material and financial responsibility for activities of subordinate scientific organizations.

The lack of a real client (one materially responsible for using the NIOKR) for most scientific and technical developments.

The management of scientific organizations with the help of indicators (limists on staff, cost of work completed, thematic assignments for completing NIOKR) which are not linked to results by scientific research institutes and design offices and which do not reflect contributions to solving technical problems in the sector. As practical experience shows, such indicators give only qualitative characteristics of scientific-technical activities and do not orient scientific organizations towards attaining final results for the national economy.

The deterioration of staff composition in sectoral science due to the lagging of economic incentives for scientific and technical achievements behind incentives systems used in other spheres of the national economy. This leads to a drain of the most talented workers from science.

The multistage nature and complexity of management decision making with regard to strategy and tactics in setting priorities in science and technology. This has often led to collective irresponsibility for results from scientific and technical activities and had hindered creative initiative.

The low levels of material and technical support for scientific organizations. The considerable technical backwardness of scientific equipment compared to equipment used in industry.

The weakness, and not rarely, the lack of experimental units in scientific organizations.

A sector's monopolization of science, which is due to main sector scientific organizations supporting research in the main scientific and technical directions.

Reductions in the reserve of basic science and technology on hand. This is because there is no organ responsible for formulating and implementing a unified scientific and technical policy in a sector and the lack of economic incentives for completing long term basic research. This creates a growing gap between sectoral science and academy science. Attempts are made to close it by partial

improvements in already attained results and through a continual orientation towards similar available foreign work. The unavoidable result of this tendency is a growing volume of work meeting the interests of superior management organs in the sector. In many ministries this accounts for one-third of all work.

The lack of elementary surveys of scientific and technical potential in sectors and of scientific and technical and economic results attained by all organizations in science and science services.

The understandable consequence of unsolved problems is the inefficient use of resources allocated to science, the low quality and scientific and technical standards of research and development, their unsuitability for use in production, the inappropriateness of scientific organizations' NIOKR to their main areas of activity. Work is small scale work and there is duplication as well as other problems.

The basic characteristics of the present ailments in sectoral science were revealed and specified in the CPSU Central Committee and USSR Council of Ministers Decree (No. 760 on 24 September 1968) "On Measures to Improve Work Efficiency at Scientific Organizations and to Accelerate the Use of Scientific and Technical Achievements in the National Economy", and were, to a great extent, repeated in Decree (No. 814 on 14 August 1983) "On Measures to Acclerate Scientific-Technical Progress in the National Economy." A systematic and basic implementation of the measures in these directives would have made it possible to eliminate most negative tendencies, which have accelerated since then.

In particular, Decree No. 760 made provisions for the techno-economic substantiation of NIOKR plans and the use of scientific and technical achievements, based upon an evaluation of the technical level of new types of equipment intended for development or introduction, their economic efficiency, national economic importance, long term prospects. etc. A requirement was put forward that accounts and reports on scientific and technical developments be made in order to determine the correctness of scientific and technical policies in sectors and to evaluate the efficiency with which scientific and technical potential is used. Systematic analysis, from a ministry perspective, of subordinate scientific organizations' activities was determined to be an important tool for improving the management mechanism for sectoral science.

The set of administrative and economic management measures outlined in the degree would undoubtedly have played a decisive role in solving these problems. However, responsibility for most of them was entrusted with ministries and agencies. **A mechanism for state review of scientific and technical activities** is necessary for these measures' systematic implementation. The GKNT's practical experience in conducting these reviews over the past three years has shown their high efficiency. In spite of extra-agency reviews being purely administrative measures, in view of the present organization and management of sectoral science, a state review makes it possible to activate sectoral ministries work in improving the management of subordinate scientific organizations.

An analysis of results from activities at scientific research institutes and design offices and a summary of state (extra-agency) and agency reviews of scientific organizations, conducted by GKNT during 1984-1986 shows that **fundamental perestroyka in science is possible only if there are changes in the organizational and economic mechanisms for the functioning of the science and science services sector.** This presumes the following measures:

Various types of scientific organizations (with independent balance sheets, and those in NPOs [Scientific production associations], production associations, MNTKs [Intersectoral Scientific and Technical Complexes], engineering centers, ect) together with state and cooperative enterprises should be viewed as the basic cost accounting elements in a single national economic complex, completely covered by the Law on State Enterprises (Associations). While production enterprises are called upon to increase their own economic potential, scientific organizations, as a special form of state enterprise, have the goal of developing the scientific and technical potential of the sector or country as a whole.

The activities of all types of scientific organizations are to be structured to correspond to the directions for scientific and technical development as determined by state policy, which should have the force of law. Scientific research institutes operate on the basis of long term normatives and contracts with clients for their products and state contracts for the most important work.

Scientific organizations are to function on full cost accounting, self-financing and self-support [samookupayemost]. Their scientific and technical and social activities should be supported by the collective's earnings. An organization 's profits serve as a composite indicator of economic management activities. Part of the profits will be at the complete disposal of the collective and, together with payments to labor, be the collective's income. The remaining profits are used to meet obligations to the budget, banks and ministries.

The implementation of these measures requires **a fundamental change in economic and operating relations between scientific organizations and superior organs and with the purchasers of scientific and technical products.** The operating and economic ties between participants in the scientific production cycle must be based upon direct economic contracts and long term normatives for labor and resource inputs. In their turn, these long term normatives should be approved for five years.

Instead of petty regulation of scientific organizations' day to day activities, ministries, departments and central economic organs should concentrate their attention on the formulation of scientific and technical policies and on monitoring their implementation, both within a sector and in the country as a whole, seeing that long term national economic interests are met. Under these conditions the basic tools for leadership organs should not be administrative ones, but economic ones, promoting scientific organizations to more effectively use the state resources allocated to them.

These principles will change the specific organizational-economic methods for the management of science and technology at all levels of the national economy. The GKNT will have to work out and monitor the implementation of long term (up to 20 years) and five year state scientific and technical policies. Provisions are made for the main directions in science and technology and for sectors' basic tasks in priority problems on improving production's technical standards and reequiping it.

Based upon assignments and resources allocated to them, ministries and agencies form a network of scientific organizations which will most effectively use the acquired scientific and technical potential to solve scientific and technical tasks. It is advisable to form a network of scientific organizations within the time frames in state scientific and technical policy. The monitoring of its efficiency should be entrusted with ministries and the GKNT. Superior organs, which have set up scientific organizations and approved plans for their activities bear full financial and legal responsibility for their scientific and technical and economic results and should improve their work.

Based upon assignments in state scientific and technical policies, the GKNT assures the allocation of resources and the distribution of state orders for top priority and intersectoral problems. It has full financial and legal responsibility for the economic and scientific and technical results attained by the organizations involved.

Scientific organizations formed by assignments from ministries, agencies and state orders by the GKNT are necessary for the cost accounting over assignments during the plan period, include them in their thematic plan which is approved by the ministry or other superior organization. The state budget finances basic research work done at Academy scientific research institutes and scientific organizations at higher educational institutions and sectoral institutes as part of long term scientific and technical policy. The GKNT is responsible for results and for monitoring the use of resources allocated for solving basic problems.

The scientific substantiation of long term scientific and technical policies, a unified policy for the development of science and technology in sectors and the monitoring of results at scientific organizations require the creation of a system of analytic work in the science sphere, without this its restructuring is impossible. Analytic work requires an inventory of scientific and technical potentials, a systematic evaluation of scientific and technical and economic results at scientific organizations, a state expert review of all NIOKR work when it is put into the plan and sent for introduction at production enterprises and a state review of the efficiency with which ministries use their scientific and technical potentials.

During the scientific substantiation of NIOKR at the preplan stage costs and expected benefits are compared and the economic efficiency from using developments in the national economy is estimated. This analysis requires a well developed network of automated data bases on scientific and technical potentials and a system of information centers based upon the GASINTI [Possibly: State Automated System for Scientific and Technical Information] and the VNITsentra [All-Union Scientific and Technical Information Center].

The restructuring of the economic management system considerably increases the need to optimally combine administrative and economic tools in management. One of the main prerequisites for efficient sectoral science is the restructuring of scientific research institutes. In the final account the fate of all science depends upon how scientific research institutes activities are organized.

11574

Problems of Ensuring Reliability of Machines

18140201 Moscow KHIMIYA I ZHIZN in Russian No 11, Nov 87 pp 19-23

[Interview with Vice President of the USSR Academy of Sciences Academician Konstantin Vasilyevich Frolov, general director of the Nadezhnost mashin Interbranch Scientific Technical Complex, Doctor of Technical Sciences Anatoliy Petrovich Gusenkov, first deputy general director of the Nadezhnost mashin Interbranch Scientific Technical Complex, and Candidate of Technical Sciences Anatoliy Ivanovich Tananov, scientific secretary of the Council of the Nadezhnost mashin Interbranch Scientific Technical Complex, by KHIMIYA I ZHIZN correspondent M. Krivich: "Reliability. A Discussion on an Important Scientific, Technical, and National Economic Problem and the New, Extradepartmental Approaches to Its Solution"; date, place, and occasion not given; first paragraph is KHIMIYA I ZHIZN introduction]

[Text] Vice President of the USSR Academy of Sciences Academician Konstantin Vasilyevich Frolov, general director of the Nadezhnost mashin Interbranch Scientific Technical Complex, Doctor of Technical Sciences

Anatoliy Petrovich Gusenkov, first deputy general director, and Candidate of Technical Sciences Anatoliy Ivanovich Tananov, scientific secretary of the Council of the interbranch scientific technical complex, answer the questions of a KHIMIYA I ZHIZN correspondent.

[Question] Reliability is a broad human concept which does not require explanations. If something does need them, this is its narrower, more technical meaning. What is now understood by the term "reliability"?

K.V. Frolov. I cannot agree that the technical concept of reliability belongs to narrow concepts. On the contrary, it is of a comprehensive, I would say, an all-encompassing nature. Judge for yourself, the dependability of equipment, its durability, maintainability, and keeping quality, that is, the properties of the things surrounding us and of all the equipment that serves human progress, on which the efficiency of the use of machines, mechanisms, and components and the preservation of the useful qualities of each thing throughout its life depend, are included in it.

A motor vehicle should pick up a certain speed and have a certain carrying capacity and should not "eat" a lot of fuel.... Its quality includes two components: technical perfection and reliability. The entire set of technical, economic, and esthetic characteristics of a machine is not worth anything, if every day, even though due to trifles, first one, then another unit breaks down, if after a year or two wings rust, if repair is difficult and expensive. As you see, reliability is at the head of everything, precisely this technical characteristic crowns the merits of any handmade thing, any machine. Low reliability cancels all its other perfections.

Advanced units and machines are being developed for the most advanced chemical and petrochemical technologies and for the transportation of petroleum and gas, hundreds of thousand of tons of metal are being used for pipelines, which have been designed and built according to the latest word of science. But a year or two pass, and first there, then here it is necessary to replace expensive equipment and supply lines—the damage from corrosion on the scale of the country is enormous. It turns out that the most difficult task facing the entire national economy—to protect machines and components against corrosion attack—should also be examined within the framework of the problem of reliability. And the use of new construction materials—plastics, composites—should as well.

The Institute of Machine Science of the USSR Academy of Sciences together with sectorial institutes studied a new promising agricultural machine—the Don-1500 combine. It is already operating on the fields of the country, but this does not mean that the development and perfection of the machine have been completed. Thus, in the design of the combine many metal parts and assemblies should be replaced with plastic ones, then the weight of the machine will be reduced by a good 2 tons. The load on the soil—vast ecological wealth—will decrease. But the loads on the assemblies and units of the combine will also decrease, hence, its reliability will increase.

[Question] Your wrote once on the pages of KHIMIYA I ZHIZN that excess weight harms a machine as it does a person.... What is holding things up?

K.V. Frolov. In a massive machine one must not use expensive materials. Many necessary ones, and not only for combines and tractors, but also for robots, for example, organic plastics and composites, are too expensive, and besides there are not enough of them. They are expensive mainly because mass production does not yet exist. In general, the result is a vicious circle, this testifies that reliability, apart from all else, is also an economic problem. The gigantic outlays on the reconditioning of insufficiently reliable, prematurely worn out parts of machines, which have become unfit for use—12 billion rubles a year for the country—also testify to the same thing, in the language of figures. The increase of their reliability by surface hardening—chemical and laser, by the methods of plastic deformation, high-frequency plasma machining, and detonation spraying—will make it possible to reduce these national economic losses.

In general, the problem of the reliability of machines is a tight knot of other important, complex problems. It is extremely important, for example, to use the achievements of friction engineering: antifriction and friction materials, oil additives, new methods of lubrication—with gas and water, which do not require the lubrication of the bearing....

[Question] There are many publications in the press on the reliability of machines, an interbranch scientific technical complex has been established. By what is the present, so keen interest in the problem explained? Was it not caused by the higher level of the accident rate in industry than in preceding years?

A.P. Gusenkov. Historical experience testifies that throughout the world the assimilation of new sources of energy, means of transportation, and technological equipment was always accompanied by accidents of one scale or another. The costs of what is new.... Now, when equipment is being modernized at an especially rapid pace, its durability, reliability, and safety are being placed in the forefront.

The life of domestic power plants comes now to 40 years, airplanes of civil aviation and large technological units, including metallurgical, petrochemical, and chemical—20 years, aircraft engines—20,000 hours. In recent years the life of passenger cars and metal-cutting machine tools has increased by 1.5- to 2-fold, advanced, reliable machines are being developed for the agroindustrial complex, chemistry, light and the food industry, and transportation. And all the same very much still has to be

done: the most complex set of measures on the estimation of the life of equipment and the lengthening of the period of its safe operation has to be formulated and used.

There is another significant reason for the present increased attention to the reliability of machines and mechanisms. The integrated automation of production and the automation and mechanization of labor-consuming operations are under way in industry and agriculture. The national economy is being saturated more and more with complex machines and units. This is making it possible to increase labor productivity and to reduce the shortage of manpower resources in the difficult, as is known, demographic situation. But it is more difficult to service and repair complex equipment. If a sharp increase of its reliability is not achieved today, tomorrow hundreds of thousands of hands will be needed for repair.

It is well known that for many years it has not been possible to reduce the downtimes of machines and equipment due to unexpected breakdowns and current repairs. The complication of equipment without the increase of its reliability promises the only possible regrettable trend: downtimes will increase.

[Question] But this is new multibillion ruble losses.... Obviously, it is necessary to begin, if one can say it this way, with the roots of reliability. Where are they, these roots, in design principles, in the materials being used, in the technology?

A.P. Gusenkov. There and there and there.... However, the analysis of accidents and breakdowns of machines and equipment clearly indicate the weakest link: in 70 percent of the cases equipment breaks down as a result of the imperfection of technology and the violation of technological discipline and operating regulations. I believe that examples are not necessary, we are all well acquainted with them.

A.I. Tananov. The main trouble, perhaps, is that the complex problem of reliability for the present is not being work on comprehensively, from the standpoint of a systems approach. In one sector some, as you say, roots are being studied, in another others are. For example, in construction and road machine building designers are devoting much attention to reliability analyses during designing, but a reliable analysis of the breakdowns of machines during operation thus far does not exist. In the automotive industry, on the contrary, bench and ground tests have been well organized, but designing lags.

[Question] In general, we are coming to the necessity of an extradepartmental, rather, a superdepartmental approach. Did this necessity, thus, also lead to the establishment of the Nadezhnost mashin Interbranch Scientific Technical Complex under the authority of the Academy of Sciences?

K.V. Frolov. The academy should not and cannot manage sectors. It is a matter of another thing—of the formulation of the technical policy of industrial ministry and of the influencing of the reliability of their products from the idea of a new machine to its series production.

Strictly speaking, the Academy of Sciences was always regarded at the main generator of ideas for the national economy, no one disputed this role of its. If we speak about the problem of reliability, the academy's Institute of Machine Science, on the basis of which the interbranch complex was established, in the past 10 years has performed basic work, which has contributed to the development of the scientific base for the assurance of the reliability of machines and mechanisms. There are also many practical developments: the already mentioned new methods of lubrication, recommendations on the use of advanced construction materials, vibration technologies, autoresonant components of machines, means of diagnosis and monitoring, and much more. Some of this is already being used in machine building. But obviously inadequately, introduction is proceeding on a narrow front.

At the June (1987) Plenum of the party Central Committee it was said again that scientific and technical progress in our country is being hindered not due to a lack of ideas and scientific reserves, but because of the fundamental lack of receptivity of practice to innovations. Therefore, results of many years' standing, which were obtained by academic science, are only now beginning to make their way through to industrial enterprises. Such a fate befell both self-propagating high-temperature synthesis and the methods of lubrication, which are based on the phenomenon of selective transfer.

[Question] How much has been said about the fact that we need a mechanism which makes it possible to transfer a scientific idea as quickly as possible to practice.... A powerful and intricate battering ram, which breaks through the notorious departmental barriers and sectorial egotism, is needed. Can the interbranch complex become such a battering ram?

A.I. Tananov. Before speaking about the possibilities of the mechanism, it is necessary to understand its working principle. The Nadezhnost mashin Interbranch Scientific Technical Complex includes 43 organizations of 11 ministries and departments: academic institutes, sectorial scientific research institutes and design bureaus, higher educational institutions, pilot works and series-producing plants of the Ministry of the Automotive Industry, the Ministry of Tractor and Agricultural Machine Building, the Ministry of the Machine Tool and Tool Building Industry, and an entire subsector of the Ministry of Instrument Making, Automation Equipment and Control Systems, which is in charge of means of diagnosis and tests. Moreover, for us it is important that various departments were not simply include mechanically in the complex, while prominent scientists and responsible officials with the rank of chief specialists,

chief designers, and general directors of associations are personally represented in it. He belongs to the Council of the Interbranch Scientific Technical Complex and to the Council of Experts. Precisely they, the specific scientists and specialists, formulate common plans of research, development, and experimental work, give expert appraisals of the technical level of a product, compare it with the world level, formulate a common technical policy, and coordinate research.

A.P. Gusenkov. What is the result? The organizational structure of the complex is superimposed on the sectorial structure. A person, who bears much responsibility in his own sector, becomes an expert who is responsible for the problem with respect to the national economy as a whole. His interests in his own department as if are fused with extradepartmental, common national economic interests. In this, so it seems to me, lies the main peculiarity of the mechanism which makes it possible to successfully ram departmental barriers, to make the first breaches in them, and to formulate a common technical policy in the area of the reliability of machines and mechanisms.

[Question] What kinds of breaches in these barriers have you already succeeded in making?

A.P. Gusenkov. The first task, which was posed a year ago for the Nadezhnost mashin Interbranch Scientific Technical Complex during its organization, is the development of means of diagnosis and tests of components at various stages. Of course, in themselves such means—flaw detectors, various instruments of nondestructive testing, test machines and benches—will not ensure reliability. But reliability to a significant degree depends on the technology and materials. While the technology must be checked. And the materials as well—over a wide range of temperatures and mechanical loads. The standard meter and sliding calipers as means of checking are more reliable and more accurate than the carpenter's arshin, but today sliding calipers are also not enough. Now State Acceptance has begun to operate, it is charged to accept a product at enterprises, including the most complex machines. But the workers of State Acceptance in many cases turned out to be unarmed—they had in their hands nothing except sliding calipers....

A.I. Tananov. An elementary example. In case of the violation of technological discipline at the producer enterprise one must not expect particular reliability from a product. Take welding, without which one cannot produce the load-bearing structures of reactors, machines, chemical apparatus, combines, and diesel locomotives. Careless work leads to faulty fusions, cracks, and residual stresses in the welded assembly: the result is the decrease of the reliability and serviceability of the most critical components. But it is impossible to reveal all these defects without instruments.

A.P. Gusenkov. Our experts, note, leading specialists of various sectors, make the rounds of enterprises of the complex, study the technical level of the produced and used diagnostic equipment and instruments, and issue conclusions, which are sent to executives of the sector. Once again I will repeat—this is very important—in contrast to the traditional ministerial administration, with its frequent and today guiding principle "give, give!"—here there is the thorough and competent analysis of expert-specialists.

We ourselves often go on such trips, recently we were, for example, in Gorkiy, Armavir, Krasnodar, and Ivanovo. These are direct interdepartmental contacts, which rapidly draw the sector together with the sector. They help to replace equipment of yesterday with the most advanced equipment, to quickly evaluate new developments, to cooperate works, and to develop metrological support.

Here is what is also important: the new economic mechanism works for us, while we work for it. Now enterprises and entire sectors have begun to display greater interest in new equipment and in the modernization of equipment and their own products. New equipment and products of new generations yield more profit, while the profit is deductions for the funds of enterprises, including the material incentive funds and the funds of social amenities.

Meanwhile, the experts of the interbranch scientific technical complex can help directly, not through the additional profit of enterprises, in the solution locally of technical and social problems.

[Question] An example?

A.P. Gusenkov. We inspected the Tenzopribor Plant in Krasnodar. The low standards of production in several shops, which are adversely affecting the quality of the produced diagnostic instruments, were noted in the protocol which the interbranch scientific technical complex sent to the management of the Ministry of Instrument Making, Automation Equipment, and Control Systems. As a result it was decided to close the foundry, but this, as you know, is one of the works which no where, to put it mildly, promote cleanness of the air.

[Question] But what if the sector and the minister himself do not heed extradepartmental recommendations? Is there satisfaction from the minister himself?

A.P. Gusenkov. If the sector cannot and does not want to settle the issues raised by the interbranch complex, we go higher: to the Bureau for Machine Building and to the Council of Ministers. At times serious efforts are needed to achieve the discontinuation of an obsolete or noncharacteristic product and its replacement with a new one, which is actually necessary for the increase of the reliability and life of a machine.

The advantage of intersectorial cooperation is obvious. For it makes it possible to use the scientific and technical potential that has been gained by other sectors. In the matter of reliability, of course, the aircraft industry and defense enterprises have the best results. Our interbranch scientific technical complex is making it possible, in principle, to "deliver" the most advanced technologies and the most perfect methods of flaw detection, diagnosis, and tests to the automotive industry, agricultural machine building, and other machine building sectors.

[Question] How does this happen?

A.P. Gusenkov. In the sectors, in which they produce machines, on which particular demands were always made, much experience of bench tests for strength and vibration resistance has been gained and diagnostic systems with computers and advanced electrohydraulic test facilities have been developed.

Such systems and benches, which have been used a long time now in the aircraft industry, were used for the bench tests of the Don-1500 combine. Our leading institute of agricultural machine building, the All-Union Scientific Research Institute of Agricultural Machine Building imeni V.P. Goryachkin, tested the machines in the field for more than a year. Within the Nadezhnost mashin Interbranch Scientific Technical Complex it received access to advanced test equipment. In 2 months the combine underwent checking under heavy-duty conditions, all its weak—in strength, reliability, and durability—assemblies and parts were identified. The multichannel benches with computers create all the real load conditions, which simulate operation in the field, transportation conditions, and even random loads, when, for example, the machine hits a stone or the combine operator is made to take it into a ditch. Now complex modern equipment, with which the developers of massive machines just yesterday did not dream of working, software, the know-how of the most advanced sectors—all this is becoming accessible to institutes of agricultural machine building and the automotive industry.

[Question] Having begun with diagnosis and tests, you, one must suppose, have taken just one, even though important, unit of the problem. How will the activity of the Nadezhnost mashin Interbranch Scientific Technical Complex subsequently be organized and expanded?

A.I. Tananov. During the 1st year of operation of the complex we, indeed, did concentrate efforts on diagnosis and tests. But this does not at all mean that the other units of reliability were ignored.

Now our experts have prepared a survey on strengthening technologies and recommendations for industrial enterprises on their introduction. Here data banks on the latest construction materials and systems of their computerized retrieval are being used extensively. This work is being performed within CEMA, in which jointly with our interbranch scientific technical complex the Nadezhnost mashin International Center of Scientific and Technical Information has been established. The center publishes not only analytical surveys, but also procedural instructions and methods of strength analyses and tests. Such information is vitally important for all machine building sectors, it is actually becoming a "soft" product.

In general, our cooperation with specialists of the socialist countries should become more efficient. It is possible to judge its successes now not only from the number of joint protocols and trips to each other, but also from the number of jointly conducted experiments and developed new instruments and means of testing of machines. Now we are concluding contracts with CEMA member countries—the CSSR, the GDR, and Bulgaria—for the development of electrohydraulic test benches. This is affording the opportunity to develop better models of equipment in cooperation with our foreign partners.

A.P. Gusenkov. We are beginning to pull out another very important link. I have in mind the training of reliability specialists—a most important matter. The Moscow Higher Technical School imeni N.E. Bauman, the State Scientific Research Institute of Machine Science, and the Spektr Scientific Production Association of the Ministry of Instrument Making, Automation Equipment, and Control Systems have organized the Educational Research Center for the Advanced Training of Engineers. New disciplines, which provide students with the fundamentals of knowledge on how to bring a machine up to the highest conditions of reliability, are being introduced at the Bauman School.

A.I. Tananov. We are holding exhibitions of diagnostic instruments—in the country and abroad. We plan to establish at the Exhibition of National Economic Achievements a permanent trade fair and exhibition of laboratory models, prototypes, and series-produced models. Study, give orders, but!

A.P. Gusenkov. And one must not overlook general machine building technologies. The more complex machines become, the more complex they also become. In many of them the emphasis is placed on the potentials of unique skilled craftsmen, kinds of doctors of fitting sciences. Such people always were and will be worth their weight in gold, they have done much that is useful and will do much, but the technology of machine building should all the same be based on the latest NC machine tools, robotics, flexible complexes, and flexible production systems.

Or there is another problem: the question of the reliability of the very systems of the study of reliability, a kind of new stage of the problem, has arisen. It also awaits solution—scientific and practical.

All this is also inducing us to broaden the program of work of the complex. In a few years about 200 enterprises, institutes, design bureaus, and laboratories of 50

departments will already belong to it. The inclusion in the complex of newer and newer sectors will make it possible to formulate a unified national economic policy of the reliability of all products and to develop a system of the competitive selection of the best developments. For the present there is essentially no coordination among departments.

[Question] Everyone plays his own fife, but a fife, which all will play in time and without playing wrong notes, is necessary....

A.P. Gusenkov. You will not make people pursue a unified technical policy by force, the directive method, as all the experience of our economy shows, is slow and ineffective. It is necessary educate industry with the best examples and to demonstrate graphically the advantages and profitability of reliable equipment.

[Question] Will the new economic mechanism—cost accounting, self-financing, and self-support [samookupayemost]—also, perhaps, be here apart from all else a rather good educational aid?

A.P. Gusenkov. Certainly. Reliability is highly profitable and advantageous for both the producer and the consumer. And on the contrary: machines and any items, which require continuous repair and break down at the most inappropriate moment, for example, combines during the harvest, are destructive for the economy of the country and pull down the economic indicators of every producing sector and every enterprise.

Here it is also impossible to evade another aspect of the question—the profitability of science, on which profitable production is based. The Academy of Sciences and the State Committee for Science and Technology allotted the Nadezhnost mashin Interbranch Scientific Technical Complex certain assets for new developments and for scientific research, which by no means always leads to success. This is "venture capital" of sorts. However, so that the interbranch complex, which formulates science and technology policy in its field, could truly "order the music," that is, distribute new models of products, fill the orders of industry, and offer machine building enterprises advanced technical solutions, it should have for this its own financial assets. In other words, interbranch scientific technical complexes need cost accounting.

K.V. Frolov. The ministries and departments, which are interested in scientific and technical progress, in our case in the reliability of machines, are obliged to finance research, even the research which does not yield an immediate impact, and should pay for scientific ideas, consultations, and methods of analyses and tests. For this is a commodity, moreover, today, I dare say, a most valuable commodity.

Interbranch scientific technical complexes are an important step in the integration of science and production. It requires economic support.

7807

Plan of Standardization for 1988

18140210 Moscow STANDARTY I KACHESTVO in Russian No 1, Jan 88 pp 3-6, 12

[Article: "Standardization in 1988;" passages in boldface are as published]

[Text] The restructuring of the management of the economy of the country and the creation of the necessary conditions for the radical increase of the technical level and quality of a product require the improvement of all the activity on standardization, metrology, and the evaluation and checking of product quality.

The year 1988 is the year of the restructuring of all work on standardization, therefore, the annual plan of state standardization, which was drafted by the USSR State Committee for Standards jointly with ministries and departments, to a certain degree reflects the directions and nature of this restructuring.

What are the peculiarities of the 1988 plan, how does it differ from the plans of standardization of past years?

Structurally the plan was drafted with respect to six national economic complexes. Its main direction is the bringing of standards for products up to the world level and its exceeding. Here the plan assignments on the standardization of a product encompass all types of work: the formulation of new standards, the revision, the making of changes, the extension of the term of effect, and the repeal of standards. The decisions of the 27th CPSU Congress and subsequent CPSU Central Committee Plenums, the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 May 1986, "On Measures on the Radical Increase of Product Quality," as well as the programs of the bringing of standards up to the world level, which were prepared jointly with ministries and departments, were made the basis of the plan.

The unity of the work on state and international standardization is ensured in the plan. In this connection assignments on the direct application of international standards, the drafting and revision of domestic standard technical documents on the basis of international standards, and the direct application of CEMA standards have been established.

The assignments on the state inspection of standards and measuring equipment stem from the necessity of the assurance of the intensification of the interaction of organs of the state inspection of standards and means of measurements with organs of state product acceptance, the encompassing by state inspection of the products of

all enterprises, at which state acceptance has not been introduced, and the tightening up of monitoring at the stage of the development and use of products.

If we speak about the specific sections and assignments of the plan, it is especially necessary to direct attention to the following.

The Sets of General Technical and Organizational Methods Standards. According to the plan, in 1988 their radical revision and optimization will be carried out. Not assignments on the formulation and revision of individual standards and documents, as was previously the case, but assignments on the complete revision of the 15 sets of standards, which have been accepted for further optimization and improvement (the remaining sets will be eliminated), have been included in the plan. Here the improvement of the structure and composition of the sets should be carried out, the compatibility of the sets and subsets of standards should be ensured, their duplication should be eliminated, a number of state standards should be transformed into documents of a recommendatory nature, the number of standards included in the sets should be reduced, and the procedure of performing work on standardization under the new conditions of management should be specified.

The formulation and revision of standards for a product is one of the most important sections of the plan.

By the end of 1988 the number of state standards with long-range demands on products of machine building will exceed 500, they will encompass all the most important types of products of the machine building complex. In 1988 such standards will be formulated for electric overhead cranes, overhead conveyors, electric trains, vulcanizers, stationary compressors, air coolers, contactors, relays, switches, metal-cutting, diamond, and abrasive tools, secondary pneumatic instruments, batchmeters, typewriters and automatic typewriters, rollers, excavators, asphalt spreaders, vibrators, equipment for the processing of wool and silk, for the leather haberdashery industry, and others.

As a whole in 1988 work will be performed on nearly 3,700 state standards, of which about 2,700 should be approved, revised, changed, and extended. Moreover, it is a matter not so much of the number as of the technical policy which is behind this: the increase of the number of standards with indicators that conform to the highest world level.

Here the plan ensures the coordination of the standards for the final product with the standards for raw materials, materials, and components. This was incorporated in the programs of comprehensive standardization for the 12th Five-Year Plan. Unfortunately, such programs do not exist for all sectors, which, undoubtedly, decreases the effectiveness of the work on standardization.

The plan of state standardization envisages **assignments for USSR ministries and departments on the fulfillment of the obligations of the USSR in the Council for Mutual Economic Assistance on the formulation and implementation of CEMA standards.** More than 80 percent of all the assignments, which are included in the plan, are aimed at the standard technical support of products which are the object of agreements on the specialization and cooperation of production of the CEMA member countries.

Among the CEMA standards, which are being formulated in 1988, are standards for items of the element base for radio electronics, means of measurements and the control of technological processes, flexible production systems, industrial robots, semiconductor and special materials for the production of items of electronic and microprocessor engineering, high-performance precision metal working, forge and press, and foundry equipment and equipment for the wood processing and furniture industry, and machines for the complete mechanization of agriculture and the efficient and waste-free processing of food raw materials.

This year more than 500 CEMA standards will be used in the USSR national economy and in contract law relations between the USSR and other CEMA member countries.

Among the ones, which are being put into effect in our country, are CEMA standards for such types of products as petroleum products and chemical items, metallurgical raw materials, mineral fertilizers, machines and equipment for the metallurgical industry, power plants, instruments, technological equipment for the processing industry, and household appliances, with respect to which reciprocal deliveries will be made.

More than 900 assignments in support of the problems of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 200 are envisaged in the plan. These assignments, for the most part, envisage the formulation of standards in such directions as electronization, the automation of production processes, and atomic energy.

For the purpose of using international experience in the increase of product quality in the 1988 plant **much attention is devoted to the use (including direct) of international standards in the national economy.** It is a question of products of the sectors which are managed by the ministries that are participating in the work of the technical committees of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (MEK), including managing the secretariats of the technical committees.

However, here it must be said that individual ministries are using inadequately the possibilities of international standardization for the increase of the effectiveness of state standardization. It is possible to group with them

the USSR Ministry of the Automotive Industry, the USSR Ministry of Tractor and Agricultural Machine Building, the USSR Ministry of Machine Building for Light and Food Industry and Household Appliances, the USSR Ministry of the Machine Tool and Tool Building Industry, the USSR Ministry of Ferrous Metallurgy, and the USSR Ministry of the Chemical Industry.

In 1988 the formulation of international standards will also be carried out. Assignments are envisaged for 23 USSR ministries on the formulation of standards within 22 technical committees of the International Organization for Standardization and for 10 ministries within the International Electrotechnical Commission.

As is known, **the unification of the output being produced** is of great importance for the expansion of production specialization. The 27th CPSU Congress posed the task to achieve the maximum unification of assemblies and parts and to implement measures on the development of machines, equipment, and instruments on the basis of modular block and base components.

Assignments for 11 ministries on the increase of the level of unification with respect to 115 classification groups of the most important products of machine building and instrument making and consumer goods are established for 1988 in the plan of state standardization.

Among them are such types of products as steam and hydraulic turbines, steam boilers, drilling rigs, mine loaders and hoists, overhead cranes, mainline diesel locomotives, freight and passenger cars, diesel engines and diesel generators, various types of pumps, metal-cutting machine tools, automatic forge and press machines, universal assembly attachments for machine tools, instruments, motors, agricultural, industrial, and logging tractors, grain, corn, and potato combines, beat harvesters and cotton pickers, bulldozers, excavators, scrapers, self-propelled graders, equipment for the processing of agricultural products, dyeing and trimming equipment, household sewing machines, television receivers, refrigerators, washing machines, and others.

The indicators, which are established in the plan, specify the degree of saturation of items with parts and assemblies of general machine building, intersectorial, and sectorial application. The specification of the level of unification of parts in accordance with the indicated indicators will simplify calculations and will decrease the amount of design documentation.

In connection with the broadening of the independence of territorial organs of the USSR State Committee for Standards in the plan of state standardization for 1988 **the assignments on state inspection** make up only 10 percent of the total annual amount of work of the organs of state inspection (the territorial organs make the other checks at their own discretion).

The materials and suggestions, which are received from organs of state acceptance, the reporting data of the USSR State Committee on Statistics on complaints about products, the suggestions and complaints about product quality, which were received from related ministries, departments, enterprises, and organizations, as well as materials of the press, radio, and television were taken into account.

It is also envisaged to check the entire range of products of enterprises of the machine building complex at the stage of development.

For the purpose of coordinating the work of state acceptance and state inspection and in connection with the expansion of state product acceptance as of 1 January 1988 assignments on the monitoring of the quality of the most important consumer goods and products of the agroindustrial complex, as well as checks of enterprises, which render production services to the population, are established in the annual plan of state standardization.

In the area of **the metrological support** of science, industry, agricultural production, and the infrastructure the further development of domestic metrology, the increase of the extent of measurements in all spheres of social activity, the increase of the demands on the accuracy of measurements in the sectors of the national economy and the fields of science, and the broadening of the ranges of measurements with the simultaneous complication of the conditions of measurements are planned for 1988.

The improvement of the existing standards of weights and measurements will be carried out, new systems of standards of weights and measurements and automated standard complexes will be developed, and the development of new methods of precise measurements will be carried out. In all 10 state and working standards of weights and measurements, 8 units of the highest precision, 22 standard means of measurements, 95 standard specimens of the composition and properties of substances and materials, and other things have to be developed.

The increase of the skills at the All-Union Institute for the Increase of the Skills of Managerial Engineering and Technical Personnel in the Area of Standardization, Product Quality, and Metrology of 15,700 management personnel and specialists (as against 15,100 in 1987), including 300 workers of state product acceptance, is envisaged for 1988.

As has already been noted, the plan of state standardization for 1988 has its own peculiarities, which are connected with **the improvement of the work on standardization and metrology under the new conditions of management,** but it does not yet reflect completely the

questions of restructuring, which is presently being carried out by the USSR State Committee for Standards, in the area of standardization, metrology, and the evaluation and monitoring of the technical level and quality of products.

In the report of General Secretary of the CPSU Central Committee M.S. Gorbachev at the joint solemn meeting of the CPSU Central Committee, the USSR Supreme Soviet, and the RSFSR Supreme Soviet, which was devoted to the 70th anniversary of the Great October Socialist Revolution, it was stated: "The goal of the radical economic reform, which has been started in the country, is to ensure in the next 2-3 years the changeover from an excessively centralized, command system of management to a democratic system, which is based primarily on economic methods and on the optimum combination of centralism and self-management."

During the commenced year of 1988 the cardinal reform of the state system of standardization, of which the assurance of the optimum combination of state interests with the necessary independence of industrial enterprises will be the main goal under the new conditions of management, will be accomplished.

The restructuring of the work on standardization presumes the increase of the role of the comprehensive standardization of products, which under the new conditions of management, given the development of direct contacts of enterprises, is becoming an effective tool that ensures the coordination and linking at the state level of the indicators and characteristics of products and their elements—components, raw materials, and materials.

Here the requirement of the formulation of standards and specifications for productions with the maximum use of advanced domestic, international, and foreign know-how and, first of all, on the basis of international standards is most important.

In the area of metrology steps, which ensure the pursuit of a purposeful technical policy on the assurance of the unity of measurements in the national economy, will be implemented. These are the development and use of state standards of weights and measurements, the state checking of means of measurement and the inspection of their state and use, the organization of state tests of means of measurements, which are being developed, produced, and imported, and the coordination of the activity of ministries and departments in the development of new generations of measuring equipment and in the development of advanced methods of measurements, which are necessary for the leading development of the most important sectors of the national economy.

In early 1988 the USSR State Committee for Standards by the forces of its institutes will prepare suggestions on the improvement of the planning of standardization, based on the new conditions of management and the restructuring of the management of the national economy. These suggestions will be considered with the participation of ministries, departments, enterprises, and organizations. They will take into account the new positive features of the 1988 plan of state standardization, as well as what it has not yet been possible to settle.

The accomplishment of the assignments of the 1988 plan of state standardization and the simultaneous restructuring of the state system of standardization will create important prerequisites for the accomplishment of the task of the radical increase of product quality.

7807

Marchuk on Scope of Academy Restructuring

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[Article by President of the USSR Academy of Sciences Academician G. Marchuk under the rubric "Improve the System of the Development of Science, Public Education": "The Academy of Sciences: The Bounds of Restructuring"]

[Text] The role of science, which is called upon to promote in every possible way the successful implementation of the policy of the acceleration of the socioeconomic development of the country, which was formulated by the party, is great. In the past 2 years the main directions of the further development of the basic sciences, and first of all mathematics, information science, biotechnology, high-energy physics, chemical technology, agrarian science, and medicine, have been specified. The tasks in the area of philosophical, socioeconomic, and legal research and in the study of cultural heritage have become clearer.

However, it is well known that the achievements of scientific and technical progress in our country for many years did not find proper embodiment in the practice of management. But one must not "write off" everything to imperfections and direct omissions in the mechanism of introduction. Science as a whole and, in particular, our Academy bear here their own share of the responsibility. For precisely academic science is called upon by the results of its basic research to ensure a breakthrough in the most important sections of the development of social production.

Today, under the conditions of restructuring, the social role of science is increasing sharply, the public and moral duty of scientists is growing. And this is not by chance. Never yet have scientific developments, designs, and decisions affected so directly the fate of millions and millions of people, entire countries, and the whole planet as today.

It is a question of tasks common to all mankind, their very posing is a vivid sign of the modernization of the life of our society. This process is assuming more and more specific forms, is taking in a constantly expanding group of problems, and is encompassing new spheres of the labor and creativity of the Soviet people.

In the country the process of the democratization of all aspects of life is developing and intensifying, the attitude of people toward labor and toward the fulfillment of their production duties is changing, and new methods of management are being introduced. The present revolutionary changes have brought to the forefront the contradiction between the requirements of modernization, creativity, and creative initiative and conservatism, inertia, and selfish interests, between the increasing activity of the masses and the still living bureaucratic style of activity in the most diverse areas and the attempts to freeze restructuring. The sweeping away of the mechanism of deceleration requires urgent and decisive steps—both in scientific policy and in the firm establishment of new approaches and norms in state and public life.

The most effective means here is the extensive development of democracy and the strengthening of glasnost. Administrative methods of the management of society and various aspects of its life, including scientific research activity, are hindering our progress. Democratic and only democratic forms are capable of giving it a vigorous push.

At the recently held meeting of the party and economic aktiv of the USSR Academy of Sciences we attempted from the viewpoint of the June (1987) CPSU Central Committee Plenum to evaluate the progress of restructuring at the Academy, to specify our role in the vast constructive and creative work, which has been launched in the country, and to commit all the forces of science to the search for the optimum solutions.

In our present activity we are basing ourselves first of all on the instructions of the 27th party congress on the necessity to increase the role of the Academy of Sciences as the coordinator scientific research work in the country and to increase its responsibility for the development of the theoretical bases of fundamentally new types of equipment and technology.

A good reserve has been formed here for the development of this work. But it would be a serious mistake to confine oneself just to the interests and needs of today. Basic research is obliged to lead the needs of technology and production, therefore, in conducting this research, we are basing ourselves on the necessity of developing the theoretical bases of equipment and technologies of the future. The main task of the Academy lies in this. It is possible to accomplish it only by concentrating scientific forces and material resources on the most promising, priority directions of domestic science.

In 1986 at the October session of the General Assembly of the USSR Academy of Sciences the decision on the drafting of forecasts of the development of the most important directions of modern science, including at the Academy, was adopted. Some work has already been done. In 1988 it will be completed, and steps on the strengthening of the interrelation of domestic science and technology will be implemented under the supervision of the USSR State Committee for Science and Technology. But it is possible already today on the basis of the available evaluation data to specify the prospects and means of the acceleration of scientific and technical progress in the sectors of the national economy.

At present programs of the development of basic research, in the accomplishment of which institutions of the USSR Academy of Sciences and the academies of sciences of the union republics and leading higher educational institutions and sectorial scientific research institutes will be involved, are being formulated. Such programs focus on the study of the role of the human factor in the development of modern society, the improvement of the management of the socialist economy, and the substantiation of the prospects of socioeconomic development. Much attention in them is devoted to research in the field of high-energy physics, electronics, information science, computer technology, power engineering, new materials, high-temperature superconductivity, biotechnology, chemical technology, and several other fields.

The forecasting and long-range planning of basic scientific research are one of the components of the restructuring of the Academy. It already requires today profound changes in scientific institutions, their network and structure, personnel, and the organization and support of scientific research. And, of course, the internal change of the personnel of science themselves, their consciousness, and their attitude toward work and changes of the established methods of work are needed.

Today work on the elimination of the excessive centralization of the activity of the Academy, on the extension of democratic principles, on the strengthening of glasnost, and on the increase of the responsibility of scientific collectives for the results of their activity is under way.

In November 1986 the Presidium of the USSR Academy of Sciences adopted a decree on the increase of the role of the Departments of the Academy and the improvement of the management of its scientific institutes, while in early December it adopted a decree on the improvement of the structure and the broadening of the rights and responsibility of scientific research institutes of the Academy. A temporary model statute on the Department of the USSR Academy of Sciences and the temporary Charter of the Scientific Research Institute of the

USSR Academy of Sciences were approved at the same time as these decrees. They were ratified at a session of the General Assembly of the Academy and became a law of its life.

The Departments in their present capacity are the basic scientific and scientific organizational centers, which are responsible for the development of basic research in the corresponding field of science in the country. They promote the practical implementation of scientific results and carry out the coordination of research on complex problems of academic, VUZ, and sectorial science. The Departments will contribute to the radical increase of the return of institutes as the main unit of science. At the same time the new Charter, by substantially broadening the rights and strengthening the independence of the academic institute, will make it possible to increase the efficiency of the labor of researchers.

But it must be said that the process of broadening the rights and increasing the responsibility of Departments is not yet finished. And to a significant degree due to the inertia of the staff of the Departments themselves, which are assimilating new spheres of their activity far from as quickly as would be liked. A more resolute shift from the problems of the coordination of science to the tasks of the genuine supervision of its development is needed here.

The most important direction of the work of the Presidium of the USSR Academy of Sciences on the restructuring of the activity of the Academy is the improvement of its personnel policy. Its basic means consists in the promotion and support of truly creative scientists, in the more intensive renewal of the personnel of scientific institutions, and in the harmonious combination of the knowledge and experience of scientists of the older generation with the creative energy of young scientists.

In this connection measures, which were aimed at the decrease of the average age of the management staff of scientific institutions of the Academy with the maximum retention of its intellectual potential, were elaborated. In particular, age limits for the holding of scientific organizational positions were established. At the same time, in order to maintain and strengthen the contacts of the members of the Academy, who are freed from scientific organizational positions because of age, with the collectives of their institutes and to give them the opportunity to continue creative activity, the institution of advisers was established. The positions of honorary director of an institute, adviser of the board of directors of an institute, and adviser of the Presidium of the USSR Academy of Sciences were also established. It was also deemed advisable upon the reaching by an academician of the age of 75 to open a vacancy in his specialty for a new election of full members of the USSR Academy of Sciences.

The work of the session of the General Assembly of the Academy of Sciences, at which in conformity with the Charter of the USSR Academy of Sciences the election of full members and corresponding members of the Academy was held, was permeated with the spirit of democracy and openness. We strove to elect the most talented, worthy scientists, who are capable of taking and keeping leading positions in science. An atmosphere of more exacting demands on each candidate reigned at the General Assembly. This found reflection both in the pointed scientific discussions and in the exacting evaluation of the professional and moral qualities of the candidates.

The reinforcement at the Academy is impressive: the assembly elected 83 academicians and 172 corresponding members. Inasmuch as machine building is of top priority for the development of scientific and technical progress, precisely this scientific direction in the election received the largest personnel reinforcement. In this field 7 academicians and 26 corresponding members were elected in various scientific specialties.

In the election a special place was assigned to the social sciences, without the development of which the all-round development of society is impossible. In these specialists 16 academicians and 33 corresponding members were elected.

It is characteristic that the average age of the newly elected members is significantly lower than the present age indicator of the members of the Academy. We consider this a good start of the stable influx of young forces into the detachment of the most authoritative representatives of Soviet science.

And about another aspect of the work with personnel. In order to attract talented young people to scientific institutions, it was established that the positions of scientists and scientific and technical personnel at academic institutes, which are freed for various reasons during the year, should be filled with young specialists—graduates of higher educational institutions, as well as people, who have successfully completed graduate studies and have had on-the-job training. A standard of the reinforcement of scientific institutions of the Academy with young people was also established—on the average it come to 3 to 5 percent a year. It must be admitted that the state of affairs in this section of the work is being corrected very slowly, and the process of rejuvenating science promises to be lengthy. The settlement of many issues is coming up against the poor development of the social sphere and the closed-mindedness of the central staff of the Academy. The inertia of the past has also not been overcome at research institutes themselves.

Thus far restructuring has affected mainly the top levels of organizational management structure of the Academy. True, in 1986 the certification of scientists was carried out at the institutes of the USSR Academy of Sciences. Although it was also useful, in many cases it was formal

and did not solve the problems of overcoming the stagnation of scientific personnel. The obvious resistance of the mechanism of deceleration and the resistance of people, who are not disposed to changes and do not want to work in the new way, appear in this. The appropriate conclusions are being drawn from all this.

In taking new steps along the path of democratization, the Presidium of the USSR Council of Ministers sent to academic collectives for extensive discussion the draft of a decree on the organization of the election of executives of institutes and their structural subdivisions. Its results were studied by a commission under the chairmanship of Vice President of the USSR Academy of Sciences Academician P. Fedoseyev, which generalized the suggestions of more than 100 research institutions and individual members of the Academy. Then at a meeting of the General Assembly of the USSR Academy of Sciences the corresponding amendments were made to the now prevailing Charter of the Academic Scientific Research Institute. They were formulated on the basis of the suggestions of the commission, the recommendations of the party group of the Academy, as well as the opinions and remarks of the members of the Academy, who spoke at the General Assembly.

Taking into account that the director of an academic scientific research institute is first of all a scientific leader, it was decided as follows: that the most qualified specialists in the corresponding field of science should settle the question of his appointment. Now he will be elected by secret ballot at the general assembly of the scientific collective of the corresponding Department. Here it is intended to ensure the possibility of the nomination of several candidates, each of whom should present to the collective of the scientific research institute a scientific report on the proposed program (concept) of the work of the institute.

The Academy is giving effective support to the representatives of the basic scientific unit—doctors of sciences—and is striving to broaden their participation in the management of science. For these purposes the procedure of forming scientific councils is being improved and their role in the scientific life of institutes is being increased. In conformity with the decisions of the general assembly the members of the scientific council of an institute will not be appointed, but will be elected for a new term by secret ballot at the general assembly of all the scientific associates of the institute.

It is also planned to carry out in a new way the appointment and election of the managers of structural scientific subdivisions. In the subdivisions, which previously existed and have been retained in the new structure of institutes, the candidate managers of the corresponding sector, laboratory, or division will be elected by secret ballot at the assemblies of the labor collectives. After this the scientific council of the institute, having heard and discussed the reports of the recommended candidates on how they imagine the future work of the subdivision, by secret ballot will make a final decision on the election of one of the candidates to the administrative position.

For newly established institute subdivisions an open competition of science projects will be held in the scientific council. After their discussion the scientific council will elect the managers of the subdivisions from among the people who submitted the most interesting projects. Of course, here the possibility of the voluntary transfer of associates to the subdivisions of the new structure will be ensured.

A new thing makes its way in life not without difficulties. There are the difficulties of the organizational forms of the development of academic science. It is a matter first of all of the further development of interbranch scientific technical complexes (MNTK's), which have been established for the development and extensive introduction in the national economy of the latest technologies and equipment. They have already demonstrated their effectiveness in the accomplishment of a number of difficult tasks of science and technology. However, thus far their work is being checked by a large number of unsolved organizational problems. The reason lies in the conflict of two trends—the intersectorial nature of the activity of the complexes and the sectorial management of the national economy.

Special-purpose temporary scientific research collectives are also new for the Academy. They are needed for the concentration of forces in individual scientific directions. This, in our opinion, is one of the most important tools for the display of the research and organizing talents of scientists and the implementation of promising research ideas. Unfortunately, for the present the number of such collectives at the Academy comes to a handful. We believe that it is possible here to put to use from a fourth to a third of the potential of scientific forces. Active explanatory and organizational work is being performed in this direction.

The basic indication of the changes is the intensification and broadening of research on the radical restructuring of the management of the economy and the economic mechanism at academic institutes, as well as on problems of social development. The problems of the participation of scientists of the USSR Academy of Sciences in the elaboration and adjustment of measures on the radical reform of the management of the economy are especially urgent. It is a question of the improvement of planning, pricing, material and technical supply, and the financial mechanism. The basis of their accomplishment was incorporated in the Law on the State Enterprise, which approves the basic principle of management—full cost accounting, self-financing, and self-management. Many enterprises are already operating under the new conditions, and a thorough analysis of practice and its

interpretation are required of economic scholars. Scientific studies here have to be oriented toward entering the 13th Five-Year Plan with a developed economic mechanism.

This also requires the proper legal support of the measures on the formation of such a mechanism and on the development and improvement of economic legislation. Under present conditions, in particular, it is necessary to pose in a new way the question of the significance of the economic contract in economic relations. The contract should become the basis of the formulation of the plans of the production and sale of products and a tool of the action of the principle of economic competition among enterprises. The questions, which are connected with the development of wholesale trade in means of production, with the gradual rejection of the central allocation of material resources, and with the assurance in economic relations of the priority of the consumer over the producer, also need to be studied. Questions of the further development of democracy, the formation of the world outlook of the Soviet individual, and the socialist way of life under the conditions of the radical transformations of Soviet society urgently face philosophers, sociologists, and specialists in the field of history, literature, and art.

The Academy is the center of science. The success of applied development and the development of sectorial science in the end also depend on the success of basic research. As is known, sectorial science is now changing over to full cost accounting and self-financing. The results of its applied development are becoming a special sort of commodity, the price of which will be determined by the cost of the scientific project and the economic efficiency of the final product that is produced by enterprises.

The fundamental change of the procedure of financing science—money is allocated not to a scientific research institute or design bureau, but is given for specific scientific projects and developments—signifies that under such conditions only actively working scientific institutions, which are of real benefit to the national economy, will be able to "live" well.

Of course, not all science will be changed over to cost accounting, and besides this should not be done. Academy and VUZ science, which involves a long-term and often unpredictable search for new ideas, will be financed from the budget. But it has also been decided here to increase the role of financing through state orders.

The possibilities of improving the practical implementation of the achievements of science are being expanded significantly owing to the new economic mechanism. The task of the Academy is to create the conditions so that the collective of any institute and each associate of it would be interested in the search for means of introducing their own developments and so that in this direction researchers would receive the comprehensive support of the executives of institutes and, in case of success, could count not only on a moral incentive, but also on the corresponding material reward.

The possibilities of scientific cooperation with scientists of the fraternal socialist countries for the development of bilateral and multilateral projects, individual instruments, and systems of equipment, especially when implementing the Comprehensive Program of Scientific and Technical Cooperation of the CEMA Member Countries, should be used more extensively than has been the case up to now. In 1988 the production of 150 items of new equipment, which were developed within this program, will be started.

The most careful analysis of the Comprehensive Program of USSR Scientific and Technical Progress for the Period to 2010 is also playing a fundamental role today. For it is called upon to become the basic preplanning document, the basis of long-term planning in conformity with the economic strategy of the party. All specialists of the USSR Academy of Sciences, who are involved in this program, should treat the performance of this work with the utmost responsibility and should increase drastically the scientific soundness of the choice of the most promising directions of scientific and technical progress.

I would also like to dwell on the work of the republic Academies. Scientists of the union republics, where there are more than 300 scientific institutions, in many scientific directions are working at a high level. The Academies of Sciences of the Ukraine, Belorussia, and several other union republics have recognized international authority. But not of all republics. Several republic Academies are attempting to copy the USSR Academy of Sciences both in their structure and in the range of research being conducted. Such a means cannot lead to success. We are trying to see to it that every republic Academy would have, as they say, its own character and would be the leader of specific scientific directions. In other words, it is necessary to develop as much as possible at them those directions of research, which will yield the greatest impact precisely in the given republic.

At many republic Academies much restructuring is already under way, urgent problems are being correctly posed, but what has been done is merely the start of the work. Therefore, the role of the recently established coordinating council of the USSR Academy of Sciences, which should work in such a way that all the organizing and scientific activity of the USSR Academy of Sciences would be coordinated comprehensively and in the most careful manner with the work of the republic Academies, is being increased immeasurably.

In speaking about the development of science in regions, it is necessary to note the role of the field meetings of the Presidium of the USSR Academy of Sciences jointly with the council for coordination. They were held in Vladivostok and Sverdlovsk. The Presidium adopted a decree on the transformation of the Far Eastern and Ural

Scientific Centers into regional Departments of the USSR Academy of Sciences. Such a decision was dictated by the necessity of the further development of basic and applied research, the increase of its effectiveness, the acceleration of scientific and technical progress, and the active meeting of the requirements of the national economy of these regions.

In short, now the Academy has acquired new opportunities for the settlement of the entire set of questions which are connected with the development and coordination of basic scientific research in the leading directions of science. And it is extremely important that academic research institutions would fit their new role and would become real leaders and genuine headquarters of Soviet science. A unified statewide system of scientific research, which includes academic, sectorial, and VUZ science, also can be formed only on such a basis.

Today, in beginning the most serious transformations that are characteristic of the new stage of development, our country not only is bring science to the forefront, but is also solving the problems of the development of the scientific base. Many problems have accumulated here. At many academic institutes the discontent of scientists with working and living conditions not only remains, but is also intensifying. Many facilities became crowded a long time ago, there is not enough of the latest equipment, compounds, and chemical reagents. The state of affairs with pilot and production bases does not satisfy the present requirements.

The remainder principle of the approach to the solution of social problems, which has done considerable harm on the scale of the country, could not but also affect the Academy. For the present housing construction is still being carried out at an inadequate pace, shortcomings exist in the medical service of scientists and their provision with resorts and sanatoriums.

In recent times the Presidium of the USSR Academy of Sciences has also dealt in earnest with these extremely important questions for the life of the Academy. The main thing in them is the radical improvement of the material base, the restructuring of the system of financing of research, the solution of urgent social problems, and the development of science in Siberia, the Urals, and the Far East.

And still the restructuring of the activity of the Academy is just beginning. The guarantee of its success lies in the democratization of the management of science and the entire life of the USSR Academy of Sciences. The norms and traditions of intra-academy democracy, which formed in the past, of course, are not something that is frozen. They are constantly being altered and improved, which has contributed to the achievement of outstanding results and is ensuring the depth and freedom of scientific opinions on various scientific concepts, without which the real development of science would be impossible.

Relying on the democratic tradition of the Academy, which V.I. Lenin appreciated, the creative competition of ideas, scientific programs, and entire research schools is being developed toward within its walls. He, whose projects and suggestions are more fruitful and promising, will win in the struggle of scientific approaches. The most important condition of restructuring at the USSR Academy of Sciences and of the attainment by its developments of the world level in all the most important directions of knowledge lies in this.

7807

Election, Functions of Academy Members

18140209 Moscow PRAVDA in Russian 18 Dec 87 p 6

[Article under the rubric "Returning to the Theme:" "How They Elect to the Academy of Sciences;" first paragraph is PRAVDA introduction]

[Text] The election to the USSR Academy of Sciences is under way. The press from time to time has been discussing this question. The article of N. Ilinskaya "Around Vacancies" was published in PRAVDA on 7 December. Returning to this theme, we are publishing a letter of scientists.

The Academy of Sciences, which has existed more than 260 years, is the highest scientific institution of the country, which has firmly secured international prestige. In many respects it does not have analogs in the world—neither in the scope of scientific research work, first of all in the basic directions of science, nor in the number of personnel of the highest skills, nor in the financing of basic and fundamental research.

Throughout its history it has been the most democratic organization of scientists of the country, in which choice by election (and not appointment!) both as full members (academicians) and corresponding members of the USSR Academy of Sciences and to all administrative posts of academic institutions, starting with the director of the institute and ending with the chief of a laboratory or sector, with a mandatory secret ballot has always existed.

At the USSR Academy of Sciences the process of restructuring, to which the decisions of the June (1987) CPSU Central Committee Plenum gave new stimuli, is aimed first of all at bringing Soviet science up to the highest world level in all the most important directions and at increasing its contribution to the accomplishment of the tasks of speeding up the development of Soviet society.

The basic forces and assets of the academy are concentrated on major programs and priority comprehensive research projects, which were formulated by the departments of the USSR Academy of Sciences. With allowance made for the new tasks the structure of institutes, the network of scientific councils, and personnel policy are being reformed. The mechanism of the financing of scientific work is being changed substantially for the purpose of the top-priority supply of the priority research programs. In short, many aspects of the organization and activity of the USSR Academy of Sciences are being modernized.

The closest attention is being devoted to the development of democracy and to the broadening and extension of the participation of the broadest strata of the scientific community and all associates of the academy in the management of science. And this is natural. The creative competition of scientific schools, the bold advancing of new ideas and concepts, mutually respectful and fruitful discussions, the sharing of gained experience and achieved results—such a social atmosphere in science can exist and be strengthened only under the conditions of democracy. Precisely it is the most important motive force of the progress of science.

The author of the article in question for some reason believes that at the academy "a system of election by position has become firmly established."

How is the election of academicians and corresponding members of the USSR Academy of Sciences actually conducted? Candidate members of the academy are nominated for the vacancies, which exist and have been announced in the press, by the scientific councils of scientific institutions by secret ballot. Several candidates are nominated for each vacancy. Expert commissions, the task of which is to recommend by secret ballot for each specialty from among the total number of candidates the most worthy ones, are formed in each department. The next stage is the discussion of the results of the work of the expert commissions at the meeting of the presidium. Finally, an assembly of the department, at which a discussion of the candidates is held and a decision, which is then also considered and approved (by secret ballot) by the general assembly of the academy, is made by a closed vote, is held.

Election to the USSR Academy of Sciences is a review of scientific forces, an all-union competition, and the selection of the cream of the crop on the basis of appointment by election, democracy, and glasnost.

Not only scientific associates of the USSR Academy of Sciences and the republic academies, but also workers of the higher school, industrial enterprises, and other departments participate in the competition for election as members of the USSR Academy of Sciences. The election system is formed precisely on this competitive basis. The democratic procedures of election to the USSR Academy of Sciences made it possible in the past to reject more than once candidates, who due to their position, and not their services, aspired to academic titles.

Among the elected members of the academy there are also many executives of scientific institutions, laboratories, and divisions. And this is natural.

In the system of the USSR Academy of Sciences there are more than 290 scientific institutions, at which there are more than 2,500 scientific subdivisions. The basic task of the academy is the development of basic research, therefore, it is very important that the scientific research collectives would be headed by the most prominent, leading scientists of the country in the given field of knowledge. That is why we cannot agree with the opinion of the author of the article that "the directors of an institute are often appointed in order to clear the way for them to the academy." In reality, as a rule, a prominent scientist, who has made a universally recognized contribution to the corresponding field of science, is the director of an academic institute. The system of the election, and not the appointment of a director of an institute at the USSR Academy of Sciences envisages a number of stages, at each of which the professional level, scientific services, and organizing abilities of the candidate are carefully evaluated.

Contrary to the author we consider incorrect the contrasting of scientific researchers and organizers of science. From many years of experience the Academy of Sciences has become convinced of the necessity of the fundamental combination of these functions in the activity of academicians and corresponding members and has set this down in its charter. There it is stated:

"The main duty of the full member and corresponding member of the USSR Academy of Sciences is to enrich science with new achievements and discoveries by personally conducted scientific research, the organization of the collective elaboration of leading scientific problems, and the scientific supervision of this elaboration."

Outlying scientific organizations afforded exceptional opportunities for the quick revelation of the creative potential of young scientists, whose fame crossed the borders of the country and involved them in the selection of the leading scientists of the state, who are necessary for the development of the Academy of Sciences itself with its central institutions.

N. Ilinskaya, the author of the article, writes that the large number of candidates for open vacancies will complicate the selection of the most worthy ones. It is difficult to see the logic of such a conclusion. In our opinion, a large number of candidates, on the contrary, is conducive to the selection of the most worthy ones. Of course, if, for example, there are 15 per vacancy, 1 will be elected, while 14 will remain unelected. It would be a mistake, in our opinion, to regard these 14 as offended

people. On the contrary, the very fact of nomination testifies to the appreciation of the given scientist and the respect for him, if, of course, those who nominate the candidates treat this with all seriousness and responsibility, as the Charter of the USSR Academy of Sciences requires.

But what is the situation with the age of the people being elected? No maximum age exists for election as full members and corresponding members of the academy. It should be noted, however, that the academy has appreciably "aged" and for this reason, one must assume, the age of the people being elected will be taken into account along with other factors. At the meeting of the party and economic aktiv of the USSR Academy of Sciences in September the necessity of the rejuvenation of the academy and in this connection the advisability of giving preference, all other conditions being equal, to younger candidates were spoken about. Incidentally, a positive lesson of the "rejuvenation" of the staff of the academy has already been obtained at the regional scientific centers of the USSR Academy of Sciences and at the academies of sciences of the union republics. Of course, the creative potential and the leading role in science of the candidate remain the main criteria.

It is impossible to regard as serious the suggestion on the abolition of the payment to members of the academy for a title. Their guaranteed security fully justifies itself by the fact that it expresses the recognition of the highest skills and makes it possible to concentrate on the main problems of the development of science, to display independence, and to boldly defend one's own scientific concepts and opinions, regardless of any departmental influences.

N. Ilinskaya writes that it is proposed "to hold the election in three stages: in December of this year and two rounds next year." In conformity with the Charter of the USSR Academy of Sciences, the next election will be held in either 1989 or 1990.

In all about 300 academicians and 600 corresponding members of the USSR Academy of Sciences work at the USSR Academy of Sciences. An election to the academy is announced once every 2 or 3 years. The present election was set after a 3-year period. An election, as a rule, is announced for freed vacancies in connection with the death of full members and corresponding members.

The decision was made beginning this year to reinforce the USSR Academy of Sciences with academicians and corresponding members by means of members of the academy, who have reached the age of 75 and older, while leaving the latter in its ranks as equal members. As a result this year the USSR Academy of Sciences in the election has 81 vacancies for academicians and 166 vacancies for corresponding members. We are confident that the USSR Academy of Sciences will receive a good reinforcement of its ranks.

At the pre-election meetings of scientists, which are now under way, it has been unanimously noted that during the period, when restructuring has moved on to the stage of practical implementation on the basis of the fundamental principles, which were formulated by the 27th CPSU Congress, and the decisions of subsequent CPSU central committee plenums, creative, constructive, and precise information in the press on the problems of science and scientific and technical progress is necessary. The role of science, the role of knowledge, the role of education, and the role of creativity are becoming today decisive in the completion of the revolutionary transformations of society.

Unfortunately, the critical articles meant for the USSR Academy of Sciences, which have been published recently in the press, do not always reflect the actual state of affairs and are out of touch with the real facts and events regarding restructuring in the life of the scientific collectives of the USSR Academy of Sciences. It is time to combine critical analysis with the coverage of the new positive changes, which are occurring at the USSR Academy of Sciences, and to reveal the problems and difficulties, which exist at the USSR Academy of Sciences and in the development of science at this historical stage.

Of course, science also cannot be beyond criticism, but competent and well-founded criticism. The time has come, in our opinion, to establish the newspaper NAUKA, which covers the creative research of scientists, their dedicated labor, the struggle for an idea, and intolerance toward everything that hinders the development of science and the scientific, technical, and social progress of society.

[Signed] Academicians V.A. Kirillin, G.P. Svishchev, B.S. Sokolov, O.T. Bogomolov, N.D. Kuznetsov, I.F. Obraztsov, S.N. Kovalev, A.A. Voronov, G.V. Novozhilov

7807

Problems and Prospects for Lithuanian Research and Development

18140238 Moscow SOTSIALISTICHESKAYA INDUSTRIYA 7 Apr 88 p 1

[Article by Academician Yu. Pozhela, President, Lithuanian SSR Academy of Sciences: "Means for a Breakthrough"]

[Text] **It is not worth flattering ourselves with a list of inventions. The most objective indicator for the role of science is the development level of the country's industry and economy. Our science is thus in debt to the people.**

Also, it could not show the need for important transformations and it was lagging in a number of major directions. Today, as if their eyes have been opened, many demand: "It is necessary to catch up and overtake!" However, there are few who ask: "Are we in shape to do this?"

Lithuanian scientists have done much work which is up to world standards. There is widespread recognition for their work in the theory of probability and mathematical statistics, nuclear spectroscopy and semiconductor electronics, thermal physics, biochemistry and quantum electronics. In analyzing this work it is easy to see that where the researchers' main tools are blank paper, pencils and their own minds, we are not behind anybody and are in step with the times. However, each year it becomes increasingly difficult to stay in the front ranks if one only has a slide rule.

This is understandable. Galileo observed the phases of Venus with a "viewing tube", he himself had made. Modern telescopes cost millions, and only a few enterprises are able to build them. In science the further we move along the path of learning, the more expensive becomes each advance of knowledge. Unfortunately, our financial and planning organs persistently do not want to recognize this.

Take, for example, the Lithuanian SSR Academy of Sciences. About half of its budget goes to pay associates, another fourth, figuratively speaking,goes for shelter, light and heat. Only about 1,500 rubles per worker annually is left for science—equipment, instruments and materials. What can this amount do when a simple spectrometer, necessary for every laboratory, costs tens of thousands of rubles?

It must be kept in mind that nobody is preventing academy science from earning money and doing work for industrial, construction and transport workers. We have long been using this source of financing. In some institutes receipts for contract work total 6,000 - 10,000 rubles per scientist. However, it must be kept in mind what lies behind these figures.

The problem is not even that enterprises and ministries are willing to pay only for what they want. In the final account, we see their silent agreement as sort of a "payment" ["natsenka"] for using basic results. We then set about exploratory research. With various kinds of roundabout assistance from clients we fit out our laboratories with the needed equipment. However, there is something devious about all this. The main danger is that in its rush for rubles academy science is threatened by focusing on trivial subjects and moving along side paths.

Think about the situation: a researcher capable of transforming production operations has half the equipment of a worker. His colleagues from those countries which we want to catch up with and overtake have tens of times more equipment. How can this be? Is it primarily because we still attempt to carry out research in many directions in the hope of obtaining advanced results? This is senseless. The it only one way out is to learn how to pick areas for breakthroughs and concentrate forces their on them.

The advantages of this approach are vividly shown by USSR Academy of Sciences research on high temperature superconductivity. The discovery of this phenomenon early last year excited the world of science. Hundreds of laboratories began studying it. However, it soon became clear that one could not punch a hole in this wall by tapping one's fingers on it. Efforts and resources have to be concentrated upon the most promising directions. What are they? The answer should come from a competition announced by the USSR Academy of Sciences. Among the competitors is a group of scientists from the Lithuanian SSR Academy of Sciences' Institute for the Physics of Semiconductors, which has obtained very revealing results. Its ideas and suggestions have undergone expert review and were deemed worthy of attention. Resources have been allocated to this work.

The competitive allocation of resources is the basis for the flexible management of research. This puts top priority upon the competence and objectivity of expert review. Clearly, it cannot be entrusted to science administrators. Only if important scientists and specialists do this reviewing can it be hoped that the winners will not be ordinary undeserving ideas but really promising ones. This is the position of expert review—a key element in the further democratization of science.

At the republic Academy of Sciences we have started using so-called problem councils on the basic directions of research. So that administrative "patriotism" will not win ascendency over the interests of science, we have decided not to assign institute directors to preside over councils. The very fact that chairmen are elected creates an atmosphere of equality and open exchange of information.

We have also radically changed the approach to planning basic research. One of the main obligations of problem councils is to evaluate what has been attained, compare ideas with tendencies in world science and select the most promising directions. The general plan is based upon a list of such directions and their expected results. The institutes themselves are entrusted with filling in the details with concerning subjects and performers.

Thanks to this approach, the number of line items in last year's plan was reduced at least three fold. Institutes have broad possibilities to maneuver, to rapidly react to new scientific ideas and to provide incentives for the most promising work. Together with council scientists managers have the right to quickly make organizational changes in institutes, set up temporary collectives and units, sign contracts and have researchers from different

agencies cooperate. In short, now everything depends upon how institutes use the rights granted them, upon scientists' initiative and—I want to stress—their attitudes as citizens.

While basic science retains its right to freedom of research it should not be forgotten that its main function is to serve practical ends. Today contacts with production are becoming massive. Because of this they must be skillfully managed.

In our opinion the greatest effects are obtained where production workers' long term interests coincide with scientists aspirations. However, such connections do not arise on their own—careful preparations must be made for them. Attempts at interaction based upon coordinated plans and programs have not, as a rule, had the desired results. Life has shown that it is necessary to move from coordination to cooperation of efforts based upon a common goal.

"Elektronika", Lithuania's first scientific-production complex, appeared seven years ago. Today it includes 7 enterprises, 6 sectoral scientific and design organizations, 2 academy institutes and 2 VUZes. They all interact, as it is the custom to say, on a public, voluntary basis. However, this does not prevent the complex from having unified plans and management organs in the form of a council of partners' representitives. They are all now interested in good final results and want scientists to have more and better equipment. The complex does work ranging from individual integrated circuits to medical electronics.

A distinguishing feature of the "Elektronika" Complex is that it has no head organization in the usual understanding of the word. The tone is set by the user of scientific products. The enterprise or organization for which the scientific and technical task is being solved is the "head." The people capable of completing the work become the theme managers. Most often they are representitives from production. The role of their deputies—scientific leaders and work ideologues—is usually played by scientists who know how to start and complete.

In my view this distribution of functions positively distinguishes "Elektronika" from other formations, in particular, intersectoral scientific-technical complexes (MNTK). Their "head" is at the beginning of the circuit which is "opened" by the scientific organization. As a rule, it does not have the capabilities of bringing work to its logical completion—an experimental batch or model. Even worse, it has to fight with industry to introduce work.

The "Elektronika" Complex, on the other hand, has its production plan. This provides not only for the manufacture of experimental models, but for the production of small series. This plan becomes possible because all partners in the complex have their own production facilities. Obviously, each of them is loaded to the limit and more. We started using the two percent of capacity which remains at organization leaders' disposal for flexibility. Thanks to cooperation, they have production potential which makes it possible to move from idea to embodiment in three years.

The "Electronika's" successes promted the creation of these science-production on the same principles: "Galvanotekhnika", "Lazery", "Pretsizionnaya vibrotekhnika" [Precision vibration equipment]. Their experience dispelled recent fears. If production orders are not to smother basic science they should be within the limits of its potentials. Within the long term view of our complexes and associations this condition is easily made the norm. Also, with the conversion to the new conditions for economic management the ministries have "legal" ways of acting through their "representitives" to finance basic research— in the form of state orders.

Cost accounting principles open new possibilities for science. Having become a commodity, its research and development work acquires considerable value, making its contribution to the common kettle. Essentially we are talking about converting such complexes and associations to scientific-production cooperatives, where state enterprises and organizations will be the partners. Thus the broad advantages of interagency cooperation will be placed at the service of scientific and technical progress.

11574

Science and Technology Planning in Lithuanian SSR

18140241 Moscow PLANOVOYE KHOZYAYSTVO in Russian No 3 Mar 88 pp 90-93

[Article by V. Vashkelaytis, candidate of economic sciences: "Planning NTP [Scientific and Technical Progress] in a Union Republic"*]

[Text] Materials from the June (1987) CPSU Central Committee Plenum stress the need for a comprehensive solution to economic and social tasks in the republics. It should be noted that while the planning of economic and social development in a republic is generally based upon the unity of general state, sectoral and territorial aspects, plans for the development of science and technology still have essentially one dimension—sectoral. Understandably, with such an approach, reserves of social and economic efficiency for production are not completely discovered.

The science and technology development plan includes a large circle of measures to create various types of industrial products, new technological processes and to improve forms and methods for organizing production, etc. This sometimes fragments scientific and technical progress into different directions. It is therefore especially important that measures be systematic so that from the very beginning they are directed towards good final results. This is helped by the program-targeted

approach, which, to a great extent is becoming decisive in planning scientific and technical progress, including at the republic level. It can be used in several forms: making forecasts and other preplanning documents and working out long term and current plans. Republic, targeted comprehensive programs are a relatively new use. They are based upon the unity of objectives in the problem being solved and on support for a comprehensive approach.

Including a program-targeted dimension in plan compilation for union republics combines territorial and sectoral interests and interlinkages and provides for several variants.

During the 12th Five-Year Plan 20 regional programs are being compiled and implemented. We will note a few of them.

The Comprhensive Program for the Intensification of Industrial Production in the Lithuanian SSR during 1986-1990 is a logical extension of the Comprehensive Program for Scientific and Technical Progress for the Period up to 2005 and 2010 and of the Comprehensive Program for Reducing the Use of Manual Labor in Sectors of the Republic's Economy. The Comprehensive Program for Intensification provides for the following improvements:

Intensification policies in industry;

In the use of the work force (certification of workplaces, reduction in cadre turnover, working time losses, skills);

In the use of fixed productive industrial capital;

In the organization of production, management and labor and in modernizing workplaces.

An analysis of this program's implementation during 1986 showed that it helped in further switching the republic's industry to the intensive development path. Its basic indicators for development were fulfilled and overfulfilled. Production volume increased by 4.5 percent, instead of the intended 3 percent and labor productivity grew by 4.4 percent instead of 2.6 percent. While the program called for 86.7 percent of production increases to be through improved labor productivity, in actuality the figure was almost 100 percent. It should be noted that 30 industrial enterprises attained an absolute reduction in industrial production personnel totalling 1,444 people. However, some of them exceeded the limit set by the program. The main reason for this is insufficient influence of technical progress measures upon increased labor productivity.

Through implementing the program for improving the efficiency of fuel and energy use in the Lithuanian SSR economy it is proposed to save 425,000 tons of standard fuel in 1990 and to replace scarce petroleum fuel with electrical energy.

The comprehensive program "Purification of Industrial Wastewaters" is being implemented in the LiSSR. The technical and economic conclusions obtained are the basis for measures to utilize wastes at machine building and metalworking enterprises in other regions.

A mechanism for program management is gradually being formed and a methodology worked out to determine the composition and content of republic, goal oriented comprehensive programs. The republic comprehensive program is to be approved by the LiSSR Council of Ministers or, on its behalf, by republic Gosplan, which controls the compilation and implementation of republic comprehensive programs. There are regulations covering the compilation of draft plans for republic comprehensive programs, their presentation for approval, the organization of implementation and accounting and adjustments in goals. The basic assignments in the republic comprehensive programs are included in the state plan for the economic and social development of the LiSSR for all ministries, agencies, associations, enterprises and organizations in the republic, regardless of their subordination. The LiSSR Council of Ministers or republic Gosplan designates a manager, an Interdepartmental Commission, consisting of program managers, managers of head organizations, managers of subprograms or program measures, representitives from program clients, leading scientists and specialists and a head organization to control and coordinate the development and implementation of a republic comprehensive prgram. The functions, obligations and rights of these program management organs are specified by the appropriate statutes.

Nevertheless, in spite of the broad preconceptions concerning the program-targeted method for planning and managing scientific and technical progress, there are many disputes over its methodology, as has been seen on pages of this journal.1 Directive methodological materials give only a general orientation.2 They leave open many theoretical and practical questions which developers of specific programs for republics often encounter. There are still no solutions to questions concerning the place and role of comprehensive programs in the system for planning and managing the republic economy. The appearance of a large number of programs of varying ages places importance upon the relationship of program-targeted and sector technology for planning and management.

There are differing opinions on what functions comprehensive targeted programs should have. It seems to us that the program-targeted method and the development of such programs should not be viewed as an alternative to sectoral and territorial planning. Republic targeted comprehensive programs are needed when the existing forms and methods of planning and management are insufficient for mutual coordination of sectoral and intersectoral draft plans linked by common goals and tasks.

The integration of the compilation and implementation of regional targeted comprehensive programs presumes that such integration will apply to planning and organizing the financing of such programs. Practice shows that breaking down financial measures for programs into individual sections leads to disproportions in the development of different sectors due to discrepancies between the supply and demand of financial and other resources. The mechanism for planning the comprehensive development of a union republic should not be counterpoised to sectoral planning nor simply used to compensate and make amends for "expenses" of the sectoral approach to planning, but as territorial-sectoral, assusing the objective unity of targets for sectors and territories. In planning the social and economic development of a republic there must be a sharp definition and delineation of the object of territorial planning, distinct from that of sectoral planning. It appears that these objects should be regional intersectoral scientific and technical problems which would reflect the totality of basic regional factors influencing the overall results from scientific and technical progress in a given republic. Based upon this, a comprehensive plan for the economic and social development of a republic should contain the following measures concerning the introduction of scientific and technical achievements:

Intrarepublic, directed towards solving social, economic, scientific and technical problems in the republic: on the rational use of labor resources (including the training and retraining of specialists employed in solving scientific and technical problems or introduction scientific and technical developments), the efficient use of natural resources, their optimal distribution to users, the development of production and social infrastructure, environmental protection, etc.

Country in scope, directed towards increasing the republic's contribution to national economic results throughout the country. It is impossible to do this without intrarepublic coordination and regulation of scientific, technical and production activities within the limits of functions determined by requirements to obtain the best results within minimal solution times.

To improve the planning of scientific and technical progress it is necessary to improve methodology in the following directions:

Formation of a single cycle "techno-economic analysis—forecasting—planning." This is due to the need to give more attention to preplanning and preparatory work, the forecasting of main directions in technical progress by the end of the planning period, the creation of conceptions of social, economic, scientific and technical developments in the sector or association so that draft plans and plans can be based upon them. Technical development plans should be developed earlier than other sections of the general plan.

The transition from the mechanical collction of diverse measures and using them in plans to the implementation of comprehensive long term programs to renew production and to master new items and to the technical and organizational development of the production apparatus.

Establishing reliable linkages between plans with regards to: new technology, improvements in the economic efficiency of production ; labor and wages, capital investments, economic stimulation funds and finances. There is no linkage because indicators for the production of new items differ substantially from indicators and methodologies for calculating indicators in other plan sections. Expenses are planned by cost component, but the plan section on new technology gives only totals. The planning of the annual economic effect, determined by differences in calculated costs [privedennyye zatraty], has no linkages with profits. A critical evaluation of the calculations of new technology's annual effects shows that calculations should take into account real working conditions at the object of introduction—workplace, section, shop. Increased demands should be made upon this part of economic services' work, with each calculation analyzed to see if it is substantiated.

The sequence of plans is insufficient, even though five-year plans for new technology is broken down by year. In our opinion in order to focus scientific and technical progress and to assure the timely preparation of large and comprehensive measures for the next 2-3 years, it is advisable to compile a two year rolling horizon plan for the technical reequipment of ministries and production associations (enterprises), including measures and plan indicators for the current year (up to 100 percent) and the plan preparing measures for the second year (from 40 to 70 percent).

The Sigma Production Association has more experience in improving the planning of technical progress in Lithuanian industry. In this regard it is of interest to associations throughout the country. Here they are constantly doing analytic work on basic tendencies in the future uses of its products (minicomputers) and in preparations and support for producing these items in the needed quantities. Every 2-3 years there are model and generation changes in computer systems created and produced at the Sigma PO. No more than five years passes from the beginning of a system's creation to its removal from series production. These time spans correspond to contemporary rates of product improvement in this sector. For several years there has been a precise system for planning and implementing the reequipment of production at enterprises in the association. The preparation of measures for the reequipment plan in the following year begins in the first quarter of the current year. Based upon the draft plan for production in the next two years, technical services at enterprises determine requirements for manufacturing process equipment: purchased, standardized—for the next plan year

and specialized in-house produced and purchased equipment for the next two years. Based upon these requirements orders are placed for purchased, standardized and and specialized technical equipment and plans are made for their production over the next two years. So that preparations of technical reequipment plans will move in the desired direction, calculations of the labor intensiveness of production programs are used as the basis of goals for reductions in labor intensiveness at all shops. Goals are also set for technical services. Thematic commissions are set up in shops. Based upon workplace certification these commissions prepare suggestions-orders for technical measures in each brigade. Using these suggestions-orders and their own suggestions, technical services prepare technical measures for the technical reequipment plan and determine the expected economic indicators for them.

Other practices at the Sigma Association also deserve extensive dissemination. To prevent the freezing of capital investments and delays in putting equipment into operation, group normative-limits have been developed for machine tool storage and installation times, planned capacity, loading, etc. For example, it has been established that new equipment should not be stored for more than 25 calandar days. Extensions are allowed only in exceptional instances and with approval from the directors. The central bookkeeping office is to constantly monitor the storage of new equipment, its production introduction and its actual use and to to calculate depreciation losses from equipment which has been introduced but not used. On the 7th of each month total losses by service and shop are presented to the plan-economic service in order to make the necessary deductions from the material incentives funds for these services (shops).

Under the new economic management conditions enterprises and associations will have expanded rights and obligations in solving tactical tasks in scientific and technical progress, choosing specific directions (keeping in view the subordination of the plan to the interests of the enterprise and association) and in making day to day corrections in their own new technology plan in order to solve production problems. The new conditions have influenced the cost accounting efficiency of production at associations and enterprises in Lithuanian industry. While in previous years ministries received indicators for profit growth from the introduction of scientific and technical measures and not changed them, in recent years they have usually been reexamined, and often increased by associations and enterprises. The following is necessary: further improve the planning of scientific and technical progress in sectoral ministries, production associations and enterprises in the republic; concentrate workers' efforts on the creation and implementation of large, comprehensive programs; coordinated solutions to questions of upgrading and mastering the production of new items, assure reliable linkages between the new technology plan and the other sections of the social and economic development plan.

FOOTNOTES

* Presented for Discussion

1. V. Bitunov, "Territorial Aspects of Planning Scientific and Technical Progress," PLANOVOYE KHOZYAYSTVO, No 9, 1986.

2. "The Procedure for the Formation of All-Union, Republic (Interrepublic), Sectoral (Intersectoral), Scientific-Technical Programs for Regions and Territorial-Production Complexes, the Realization of these Programs and Controls over their Impementation," Moscow, GKNT [State Committee for Science and Technology], 1984; USSR Gosplan Decree No 117, (3 June 1980), "On Basic Methodological Provisions in the Development of Targeted Comprehensive National Economic Program", approved by the USSR GKNT and USSR Gosplan 13 April 1985.

11574

Centralism, State Orders Under New Conditions of Management

18140221 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 5, 1988 pp 1, 4-5

[Article by Candidate of Economic Sciences N. Berzon, docent of the Moscow Higher Party School, and Doctor of Economic Sciences A. Papamanchuk, professor of the Chair of Economics and the Organization of Industrial Production of the Moscow Institute of the National Economy imeni G.V. Plekhanov: "Without Waiting for the Command"; first two paragraphs are NTR: PROBLEMY I RESHENIYA introduction]

[Text] The changeover of scientific organizations to full cost accounting and self-financing is a graphic example of the consistent implementation of the principles of democratic centralism.

Planning, which is the heart of management, is undergoing substantial changes under the new conditions of economic management. The first article of a series of materials on the work of science under the new conditions is devoted to this.

For a long time the relationship of the concepts "centralism" and "democracy" was regarded as a change of the amount of water in communicating vessels. Approaching the system of management from such a standpoint, they believed: the more centralism there is, the less democracy there is, and vice versa. But centralism and democracy are not mutually exclusive, but dynamically interconnected concepts. Consequently, in the process of restructuring we have to accomplish a

difficult task: to achieve the strengthening of centralized management with the simultaneous broadening of the initiative and independence of the primary units.

The strengthening of the role of centralized planning in case of the changeover of scientific organizations to full cost accounting and self-financing is manifested not in the increase of the number of indicators that are established by directive, but in the specification of the priority directions of scientific and technical progress, the establishment of a set of long-term economic standards, and the formation of an efficient system of stimulation, which channels personal and collective interests in the direction of national economic interest.

The practical implementation of the centralized management of scientific and technical progress is being ensured under the new conditions of economic management by the delivery to scientific organizations of state orders on the development of science and technology, limits of centralized capital investments and resources, as well as long-term economic standards.

The problems of establishing the proper set of standards of scientific organizations will be examined in the next article, today let us examine the mechanism of the formulation of state orders.

For the solution of the most important scientific and technical problems the USSR State Committee for Science and Technology formulates a state order, in which work in the most promising directions of science and technology, which revolutionize social production and ensure the manifold increase of labor productivity and the saving of material, fuel, and energy resources, is envisaged.

The set of operations of this sort should be limited. It is advisable to include in it the problems which determine not so much the tomorrow as the day after tomorrow of equipment and technology. Otherwise the state order will become inflated and we will again arrive at a system of the strict centralized planning of an enormous range of traditional scientific and technical developments, as was the case with all-union scientific and technical programs.

A peculiarity of the new approach to the management of scientific and technical progress consists in the fact that the state order should be formulated in a democratic manner. Suggestions on the inclusion of operations in it should come from leading scientists of academic, VUZ, and sectorial science and specialists of the national economy and should be submitted for extensive discussion by the scientific community.

The placing of a state order should be carried out on a competitive basis. The existence of several candidates makes it possible to select the scientific organization, which is capable of ensuring the most effective solution of the problem in the optimum time. It is also possible to assign the simultaneous fulfillment of the work to several organizations in order to select the most effective version for introduction in production.

The State Committee for Science and Technology formulated in precisely this way the state order for 1988. The democratization of the process of formulating the state order eliminates the monopoly of individual scientific research institutes and design bureaus and will help to accomplish more completely the task of increasing the efficiency of social production.

Along with state orders in the sectors of industry it is advisable to formulate orders for work on the development of science and technology, which are of sectorwide importance (sectorial orders). Their main goal is to ensure the creation of a scientific reserve and the implementation of sectorial science and technology policy.

Work of a basic nature and the most important research and development, which are performed in accordance with all-union scientific and technical programs, the plans of interbranch scientific technical complexes, and the comprehensive program of scientific and technical progress of the CEMA member countries, should be included without fail in the sectorial order. The financing of the work on such orders should be carried out at the expense of the centralized fund for the development of production, science, and technology.

The first experience of work under the new conditions revealed the aspiration of scientific organizations to obtain from the ministry as much financing as possible on the sectorial order. In a number of cases secondary jobs, which solve special problems, are also included in it. This is explained by the fact that scientific organizations experience temporary difficulties in case of the conclusion of contracts with enterprises. At this stage this is normal, but the more research and development that are financing by means of the centralized fund, the less the aim of scientific research institutes is to work directly in accordance with economic contracts with enterprises.

Therefore, in our opinion, it is very important to find the optimum proportions of the amounts of work, which are financed by the ministry, and the amounts of work, which are performed in accordance with contracts with associations and enterprises. Estimates show that for the implementation of sectorial science and technology policy the share of work with respect to the sectorial order in the total amount of research and development should come to approximately 20-25 percent. Scientific organizations should themselves pick up the remainder. Initially this ratio can be different, but only in order to complete the jobs which were begun earlier in accordance with supply orders of the ministry.

What is the state (sectorial) order for the institute: a whip, which forces it to perform this work, or a "spice cake," which promises the organization material benefits? From the standpoint of the new economic mechanism the order, in realizing national economic (sectorial) interests, should be economically profitable for scientific research institutes and design bureaus. In this case the coincidence of state and collective interests is ensured. Academician V.S. Nemchinov, whose work was commended by M.S. Gorbachev at the June (1987) CPSU Central Committee Plenum, called such a system "a cost accounting system of planning." He, in particular, wrote: "The cost accounting system of planning will operate trouble free only if it is based on the following principle: everything that is useful and profitable for the national economic whole should also be profitable for the enterprise that carries out the corresponding part of the plan as a performing unit." This assumption is also topical at present.

The state (sectorial) order should have economic priority as compared with other jobs. Hence, it is necessary to envisage a number of economic benefits for performers: to provide the jobs, which are performed in accordance with the state order, with financial resources at the expense of the State Committee for Science and Technology and the jobs, which are performed in accordance with the sectorial order, with financial resources at the expense of the centralized fund for the development of production, science, and technology; to establish incentive markups on the contract prices for scientific and technical products; to exempt the scientific organization in full or in part from resource payments and tax deductions for the state budget or deductions from the profit for the ministry in case of the filling of a sectorial order; to decrease the standard of deductions from amortization; to establish higher standards of currency deductions at the disposal of the scientific organization.

Economic benefits are one side of the coin. The other is economic sanctions, which should be imposed for the violation of the terms of the filling of the order. It seems to us that in case of the poor-quality or untimely performance of work the developing organization should be completely or partially deprived of the benefits that have been granted to it. Here the client has the right to demand the transfer to the state budget or the centralized fund of the ministry of the assets which were received by the organization due to the beneficial terms since the start of the filling of the order.

In case of the failure to fulfill the assignments the client does not pay for the work, while the performer is obliged to return the assets, which were transferred earlier as an advance or stage-by-stage payment. Along with economic sanctions administrative liability for the failure to fill the order up to the dissolution of the subdivision or organization should also be in effect.

Self-financing introduced in economic practice the new term "self-management." The organizations now determine independently the volume indicators, which were previously approved in a directive manner and were strictly monitored. Here the calculations are of a more careful nature, while the collective tracks better than any inspector the fulfillment of the plan. And, indeed, both the level of the wage and the economic stimulation funds depend on how balanced the plan is with respect to the amount of work and the receipts from sales with the amount of available resources and the efficiency of their use.

It is not by chance, therefore, that scientific collectives, without waiting for instructions from above, developed forms of the intra-institute planning documentation and made the corresponding technical and economic calculations. That is also how it was done, in particular, at the All-Union Scientific Research, Planning, Design, and Technological Institute of Lighting Engineering (VNIISI). While preparing for the changeover to full cost accounting and self-financing, here they formulated and reported to their subdivisions the economic standards and assignments on the amount of the receipts and profit from the sale of scientific and technical products. The collective of the institute was oriented toward the establishment of direct ties with associations (enterprises), which made it possible to increase the amount of economic contractual work in 1988 by more than twofold as compared with 1987.

They also acted in a similar manner at the institute of electrothermal equipment, where the amount of economic contractual work in recent times has come to about 90 percent of the total plan of research and development for 1988.

Cost accounting and self-financing are making higher demands on the technical and economic substantiation of all directions of the activity of the scientific organization. Therefore, at scientific organizations it is necessary to draft a comprehensive plan of scientific, technical, and socioeconomic development.

"The Passport of the Scientific Organization," in which one document would contain all the necessary information on both the planned and the accounting data for a 5-year period, could be the basis of such a plan. This would make it possible to reduce the duplication and number of planning and accounting documents which are used at the organization.

It should be noted that passports of this sort have been used for a number of years now at scientific research institutes and design bureaus of the electrical equipment industry.

7807

Importance of Technology Stressed

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[Article by B. Rayzberg, department head, NIEI [Scientific Institute for Economic Research], USSR Gosplan, doctor of technical and economic sciences: "Technology—is the Main Thing Today"]

[Text] Technological progress is one of the most important directions in implementing the strategy for social and economic development based upon the thorough use of scientific and technical achievements. In the final account it is manifested in improved technical standards for production and in the quality of products attained by using the newest technology to assure that products conserve resources and have high use value.

Attaining high technical standards for the most important products requires that technological processes reach world standards. At the present stage of the scientific and technical revolution the technical improvements in public production and economic potentials are generally characterized by the progressive nature of: technology, methods for obtaining and transforming energy and information and for manufacturing items. Without exaggeration one can say that **today the main thing is how do do something, and what technology to base this on.** It has become a measure for development and lagging, a basis for success in the world market, a way of winning in world competition and the quickest way to win customers.

Concepts such as "technological progress", "technological innovation", "the export and import of technology" have become part of world economic practice. While a few decades ago technology was viewed as a support subsystem for public production, today it has acquired independent significance, in many cases acting as a final element in scientific-technical progress. The traditional local impressiion of technology as the total set of sequences of manufacturing operations is being supplemented and qualitatively changed. There is now a more comprehensive integrated concept of universal, basic technologies, having an extensive range of application within a sector or group of sectors as independent objects not tightly bound to specific type of production or product. These include plasma, laser and radiation technologies and plastic deformation.

A modern production process is not the sum of technological transformations, but a unified, integral production-technological system, organically encompassing and unifying a chain of interrelated operations, from obtaining raw materials to producing a finished product and delivering it to customers. This gives rise to the idea of closed technological cycles and comprehensive technological systems reflecting contemporary progressive tendencies in production. Technological integration influences tools, machinery and equipment. The concept "system of machines" is increasingly associated with equipment performing a complete technological process.

Taking these tendencies in technology into account is very important in planning and managing production. This is a condition for overcoming lagging behind world levels in a number of important directions.

In talking about technological progress as a relatively independent object of planning and management and an important branch of scientific and technical progress, one cannot separate it from public production and from the reproduction process as a whole. It is impossible to have an effect upon technology without taking into account its linkage to the materials, equipment and structure of output, the skills of production personnel and scientific and design support.

A breakthrough in technology, a move beyond obsolete, inefficient means of extracting raw materials, obtaining fuel and energy, processing materials, assembling items, operating and repairing equipment, quickly mastering the newest processes and reaching world levels **all require that technological policy become a most important component of economic strategy.** Under present conditions this means a program of radical technological transformation of public production in the Conceptions of economic and social development for the 13th Five-Year Plan and up until the year 2005 being worked out by USSR Gosplan, with participation by other economic agencies, Gosplans at union republics and by ministries. This involves the development of a technological strategy in accord with decisions made at the 25th CPSU Congress, the basic points of the Comprehensive Program for Scientific and Technical Progress in the USSR and the main directions in the Comprehensive Program for Scientific and Technical Progress in CEMA Countries up until the Year 2000.

Technological transformation should not only be supported by measures to sharply improve the technological level of various production operations and types of technology, but also be directly linked to perestroyka in the economy's management. The main measures in this reform should be oriented towards strengthening their impact upon technological progress.

The main tasks of the technological strategy are clear—lift domestic technology to world levels in 10-15 years. However, this orientation needs basic refinement. In order to avoid the sloganlike goals which have entered into long term planning in the past, it must be kept in mind that the advancement of technology to world levels requires colossal outlays of all types of resources and a huge scientific and technical stockpile.

Under contemporary conditions even the country's technological development and resources cannot in themselves raise it to highest world standards and keep it there in all areas for a prolonged period. Consequently,

in posing the basic tasks for this movement forward, it is above all **important to substantiate and delineate a comparatively small number of directions for technological breakthroughs and set a course for world superiority.** These may be in those areas where Soviet science has new technological ideas but practical application hinders the attainment of technological primacy. In their time the continuous casting of steel and the manufacture of cement by the "dry" method might have become such areas; it is still not too late to include powder metallurgy, progressive types of welding, the application of wear resistant coatings to the working parts of machinery, rotor-conveyor processing, deep drilling technology and new methods for obtaining and transmitting energy.

In other areas there are only slim chances to, in the immediate future, overtake competitors who are far ahead. Also, there are insufficient resources for this, so it is advisable to take measures such as borrowing and purchasing technology or using scientific-technical cooperation to reduce the gap.

The technological strategy formulated in the conceptions for long term economic and social development must, in addition to the main directions for breakthroughs, specify areas for the rational use of progressive technology.

To decisively improve production's technological standards it is necessary to substantially change the methodology for five-year plan planning. which, in accordance with the Basic Provisions for Restructuring the Economic Management System and with the USSR Law on State Enterprises (Associations) is the solid basis for planning. The acceleration of scientific and technical progress, improvements in technical standards and product quality urgently require the conversion of planning to "product", "product-technological" and even "technological." This means that together with the general five-year plan economic indicators and control figures for rates, proportions, and structure of production by "type of product, service and work" it is advisable to have plan indicators for "type of technology." The latter includes the technological structure of production, the rate of technological renewal and mastery of fundamentally new processes, progressive technology's share in total production volume and insectors and regions. General state recommendations and targets for technological transformation are provided by USSR Gosplan and the State Committee for Science and Technology in the form of control figures. These pass through ministries to associations and enterprises as the basic data for working out five-year plans.

Also, **especially important large scale highly efficient technological improvements, embodying the most refined winnowings of scientific and technical progress should be introduced in state orders, which must be included in plans.** It is important that such state orders for the mastery and extensive use of basically new technology be given top priority in the central allocation of material and financial resources and that normatives be used to set subsidies to give enterprise collectives incentives for fundamental technological transformations.

State scientific and technical programs for the five year plan are capable of playing a significant role in introducing large technological innovations. Most of them can and should be technological in nature, attracting to their orbits an entire circle of sectors and spheres of production and organizations interested in using the technology mastered. A sectoral and intersectoral program is a set of specifically addressed measures for research, experimental testing, debugging, application and final use of highly efficient resource saving technology capable of radically raising the levels of automation, reducing manual and unpleasant labor, improving productivity and favorable influencing the qualitative indicators for products and work. This does not exclude the possibility of directly including such measures in state orders for the five-year plan, but they can be in a special program state order. Technological programs can be pivotal in the five year plan of intersectoral scientific and technical complexes.

Thus, **the decisive conditions for improving the technological level of production and its attaining world level achievements to a considerable degree consist in intensifying the emphasis upon long term technological planning, the delineation of priority directions in future technology and in concentrating resources to make breakthroughs in these directions and to improve the program planning of technological progress.**

However, it would be very inadequate and even mistaken to reduce these conditions only to transformations in the methodology of planning and improvements in plan-program influences upon technology. **In addition to the leading strategic directions for the technological transformation of the national economy** which must be realized through long term state plans and programs **there are numerous methods for improvements capable of changing the face of production at each enterprise, shop, section and workplace.** The basic directions for activating this renewal are for the economic management mechanism, operating on the human factor, to give production collectives material and moral interest in introducing progressive technology. The enterprise's right to independently compile and approve its five-year and annual plans will promote such "self-management" of technological progress.

The radical reform of the economy's management and the approval of the Law on State Enterprises (Associations) create the necessary prerequisites for using economic methods as a powerful tool to improve technological standards in production. It is also necessary to convert to an economy in which lagging technology would lead to loss of customers, prevent the profitable sales of output, not yield sizable profits and thus cost a lot, even putting the existence of the enterprise in

question. Then the search for progressive methods of manufacturing would become a vital necessity for the collective, each production unit and worker.

The economic management mechanism created during perestroyka, a mechanism based upon genuine and full cost accounting, self-financing, increased enterprise independence and responsibility and self-management by labor collectives, potentially has elements providing impetus for introducing progressive technology, its regeneration or creative assimilation. The task is to transform the possibilities in the decisions into reality so that the economic management mechanism will direct collectives' interests and activites and the functioning of production units into progressive and efficient work methods. An indispensable condition for this mechanism is that payments to labor, incentives, financial-credit relations, rates, taxes, fines, sanctions and economic normatives for distributing income and profits, in short the entire arsenal of economic stimuli and tools create and maintain a linkage between work quality, and cost accounting income, wages and material incentives.

This requires structuring the mechanism so that it maintains and develops the following cause and effect relations between progressive technology and its stimulation:

Material saving technology—reductions in material intensiveness—economies in material resources—reductions in production cost—growth in profits and cost accounting income—increases in the economic stimulation fund and labor payments fund;

Labor saving technology—reductions in labor inputs—growth in labor productivity—increases in output—growth in sales on domestic and foreign markets—increases in wages fund and profits—increases in economic stimulation fund;

Labor saving technology—improvements in product quality—price increases—growth in sales, profits and cost accounting income—increases in wages fund and economic stimulation fund;

Capital saving technology—increases in output-capital ratio—growth in output—increases in sales volume—growth in profits and cost accounting income—increases in wages fund and economic stimulation fund.

Naturally, under actual conditions, the economic management mechanism's functioning differs from an ideal scheme and does not have such a one directional character. Some elements in the mechanism providing incentives for progressive technology can give differing results, with both favorable and unfavorable components. Thus, the use of labor saving technology sometimes leads to increases in the capital-output ratio, while the use of qualitatively progressive technological processes can be accompanied by growth in labor inputs and a decline in the output-capital ratio. Resource conserving technology generally requires sizable capital investments for modernization.

Therefore, technological transformations of production and the structuring of the economic management mechanism to promote themmust not be based upon requirements to simultaneously improve all efficiency indicators and raise the technological standards quality of production and final products. It is important that the positive effects (in terms of economies and costs) exceed negative ones and that costs be recovered during the time the new technology is in operation, taking into account the scale of applications. The economic stimulation mechanism should also promote such technological progress. In restructuring the economic management mechanism it is also important to deal with social effects from the use of progressive technology.

With an economic management mechanism directed towards creating material interest in improving the technological standards of production, thought should be given to positive and negative feedback between technological and economic sanctions so that they operate according to this principle: low quality production (low efficienty, high resource intensiveness)—reduction in demand for product (service or work)—reduction in sales volume—reduction in economic stimulation fund and wages fund—need to restructure production or curtail enterprise functioning.

To improve the reliability of the stimulation mechanism for technological transformations it is desirable to include economic competition and contention between enterprises producing the same type of product or doing the same type of work. Those with progressive technology will be the victors.

The conversion of enterprises and associations to full cost accounting, self-support and self-financing will promote technological advance through the formation of additional internal financial resources. The use of production development funds and science and technology funds formed from profit (cost accounting income) as noncentralized capital investments for technological reequipment and the reconstruction of existing enterprises will create additional resources for renewing production. Because by the end of the current five-year plan noncentralized capital investments using enterprise earnings will account for 50 percent of total capital investments, technological progress will obtain additional financial support.

In analyzing conditions for technology to reach world standards and in formulating measures directed towards this, it is important to keep in view not only the zone of its use but also it development and experimental testing.

Planning, organization and economic stimulation should promote the creative search for innovations and their more rapid production introduction.

Fundamentally new technology usually is born within the walls of academy and VUZ laboratories, intersectoral and sectoral scientific research organizations and technological offices. Its reaching world standards depends upon how well management methods and organization open a direct road between innovations and production. Overcoming the barrier in this most difficult link in the cycle "science - engineering - production—use" requires **restructuring the present management of scientific and technical progress.**

It is necessary to convert to the complete planning of scientific research and development, experimental elaboration, the introduction and effective use of progressive technology. The program objective method should be the main tool of complete planning. State plan orders should lay the roads in the most important scientific and technical directions.

The conversion of scientific research organizations engaged in technological work to full cost accounting, self-financing and contract work directly for clients will play a decisive role in economic stimulation to scientific and technical research. The transformation of technological developments into scientific and technical products will create a reliable basis for cost accounting and material stimulation. Scientific research and design-technological institutes' economic stimulation funds formed on a normative basis must be linked not only to the estimated, expected social-economic effect from results, but to the actual effect. Sizable changes in the time required to attain the actual effect when compared to development time can be taken into account by subsequent compensatory positive and negative stimulation, proportional to the difference between the actual and estimated effect and the transfer, to its developers, of some profits production units obtained from improved technology.

Scientific and technical perestroyka also accelerates technological progress. By this perestroyka is meant the transformation of existing and the creation of new organizational structures to manage the development, mastery and use of technological achievements capable of organically combining science with production.

The intensive production introduction of progressive technology can be assisted by the formation of scientific-production associations, including scientific and technical institutes, design-technological offices and production enterprises. Intersectoral scientific and technical complexes (MNKT) are a new organizational form, capable of reducing the cycle from the development to the introduction of fundamentally new, widely used technology, the creation and use of which requires coordinating the efforts of several sectors. It is gratifying to note that a considerable share of the more than 20 MNTK are involved with technology.

Providing all sectors of the national economy, production operations, enterprises and associations with contemporary, highly progressive technological equipment is a key condition for technology to reach world standards. The need to reduce manual labor and to mechanize and automate production makes technological progress depend upon the tools used by labor. This means that radical technological transformations and the accelerated conversion to highly effective production processes are closely linked to the expanded production, improved standards, quality and reliability of machine building products. An important role in this task is played by machine tool building, which is closely linked to instrument building and the electronic and electrical engineering industry. To a great extent these sectors determine the fate of technological progress.

The creation, production and use of equipment materially embodying new technology is one of the most difficult problems. It must be solved in various ways and by combining possibilities. The main direction is the development of a machine building complex, first of all those areas linked to the production of technological equipment. This means not only increasing production volume, but also substantially changing the structure by raising the share of equipment helpful in introducing effective technology. The main emphasis should be placed upon the production of modern forge-press, casting, metallurgical and chemical equipment, precision machine tools, rotor-conveyor lines, machining centers and machine tools with built in microprocessors.

The demand for such equipment can be met only on the basis of the planned implementation of a program for increasing Soviet machine building and through wholesale trade in the means of production. When enterprises can use their own money to order and freely acquire this equipment, increased demands will be made upon its quality and customer pressure upon producers will force the latter to produce highly effective equipment.

Large enterprises not engaged in machine building will also supply modern equipment. Many of them have the capacity to produce specialized equipment, fittings and tools for their own needs. This aditional source should be fully used.

It is important that economic and technical policy for renewing production not be oriented towards replacing individual types and units of equipment, but towards the introduction of technological complexes and machine systems covering the entire manufacturing cycle. This is especially important in the transition to highly productive, specialized equipment and self-adjusting production systems. It is better to concentrate efforts upon the complete renewal of a single technological sequence of

operations than to try to introduce a set of machines in a line where adjacent machine tools and units are incompatible with regard to technical standards or productivity.

The staffing support to technological progress must be intensified. Courses on technology still have a very insufficient place in higher education and tl training and orientation is weak at most economic and technical VUZes. There should be substantial strengtening of the technological areas in the system for retraining and improving personnel skills.

Standardization, specialization, unification and technological control can help improve production's technological standards.

Only a goal directed policy, comprehensive assistance and activation of all basic factors and the radical perestroyka in management can bring technology to world levels.

11574

Union of Scientific, Engineering Societies Established

18140242 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 4, 16 Feb-7 Mar 88 pp 1-2

[Article by An. Shakhov: "A Response to Researchers. The USSR Union of Scientific and Engineering Societies Has Been Established"]

[Text] On Thursday, 28 January of this year, the Politburo of the CPSU Central Committee "...supported the suggestion of the All-Union Central Council of Trade Unions, the USSR State Committee for Science and Technology, the USSR Academy of Sciences, and the All-Union Council of Scientific and Technical Societies, which is based on the opinion of broad groups of the public, on the establishment of a USSR union of scientific and engineering societies. It was deemed expedient to submit this question for consideration by the 7th All-Union Congress of Scientific and Technical Societies."

On Tuesday, 2 February, the congress began working in the Great Kremlin Palace. It actually also became the first constituent congress of the USSR Union of Scientific and Engineering Societies (SNIO).

Two groups of questions appeared at the center of the 3-day discussion. The first is: How is the Union of Scientific and Engineering Societies to establish a democratic alternative to narrow departmental approaches to the problems of scientific and technical progress; how is the entire competent community to be included in the making of such decisions; how is one to afford it the practical opportunity to participate in the management of the socioeconomic positive modernization of equipment and technology? The second is: How can the union increase the prestige and, hence, the efficiency of engineering labor, which alone is capable of transforming advanced scientific ideas into the "metal" of new equipment?

There is no need to prove to the reader of NTR all the topicality of these problems.

The task of the NTR correspondent, who was accredited to the congress, envisaged the search for answers to questions which were not on the official agenda. The answer to them had to be ascertained during the congress discussion and after it.

The question of establishing a union of researchers or scientists, which in some way is analogous to the unions of writers, cinematographers, or architects, was raised by our readers in letters which were received by the editorial office. The first ones have been published in NTR (Nos 1 and 2, 1988). Letters continue to arrive to this day.

This initiative merits attention already because it comes from scientists, for the most part of the "doctoral-candidate level," and mainly from researchers in their forties. In other words, from a quite promising contingent, which, however, is unprotected for its most part by prestigious awards, titles, and a high official position.

The reality of the stagnant years, which with a regrettable lack of haste is receding into the past, often creates for such specialists a dead end situation. Here, our readers write, a fresh idea at times not only does not make it to introduction, it also does not get into the plans of research. One will not obtain for it, for example, either working or machine time, reagents, equipment, or a point on the agenda of a scientific council.

Is it possible to break out of this vicious circle directly with the assistance of the new Union of Scientific and Engineering Societies?

From the accountability report it became clear that the congress, if it does not give a direct answer to such a question, will very likely create the prerequisites for movement in this direction.

Academician A.Yu. Ishlinskiy recalls the times of 30 years' standing. The same times, during which, once dogmatists got the ball rolling, from a science cybernetics began to be considered "in the category of pseudosciences."

"The Commission for this problem attached to the All-Union Council of Scientific and Technical Societies became the only place, where cybernetics scholars could gather at that time for the professional exchange of opinions. Everyone, who now works in the field of

computational mathematics and computer technology," the speaker stresses, "is much obliged to the members of that commission and is paying tribute to their scientific objectivity and civic boldness."

The predecessor of the Union of Scientific and Engineering Societies, which is now being established, consequently, has a tradition which is capable of justifying the hopes of the initiators of the union of researchers.

"The formation of our union," the speaker confirms my confidence, "is affording new opportunities for the establishment for new formal and informal creative associations which promote the acceleration of scientific and technical progress. The people, who are seeking something new and are worried about the fate of the matter, should, finally, know and actually sense that the union of scientific and engineering societies is also the public organization, which is posing as its goal concern for the most complete satisfaction of the creative interest of specialists in the implementation of their ideas. Unfortunately, this is far from always achieved at the workplace."

Academician Ya.M. Kolotyrkin, chairman of the Moscow City Council of Scientific and Technical Societies, is also worried about this:

"For any specialist participation in the societies of the union, which we are now establishing," he insists in his statement, "may be tempting, by only on certain conditions. On the condition that membership in one scientific and technical society or another affords him additional opportunities for the display of individual creative abilities and for the realization of his own ideas, which he cannot implement in his official activity. The societies or other formations of our union should provide him with such an opportunity—either by including him in temporary creative collectives or by creating the necessary conditions for individual creative work. The experience of the most recent times has shown that precisely such forms create the best opportunities for the efficient use of the creative potential of specialists."

But is this potential great? In the accountability report indirect data in this regard are cited:

"According to the results of sociological studies," Academician A.Yu. Ishlinskiy noted, "25 percent of the specialists are not satisfied with the creative content of their activity."

It is possible not to doubt that the representatives of precisely this "fourth of discontent people" addressed their initiative to us at NTR. Let it not worry anyone that they are a minority. The generators of ideas, including the most advanced ideas, as a rule, are in the minority. But very often precisely they have the most reassuring future.

Vice President of the USSR Academy of Sciences Academician K.V. Frolov says:

"In our opinion, the granting to the Union of Scientific and Engineering Societies of the status of a creative union will increase substantially the social significance of this organization of the scientific and engineering intelligentsia."

The congress has completed its work. The resolution and the Charter of the USSR the Union of Scientific and Engineering Societies were unanimously adopted; the board was elected. Its organizational meeting is also over. The opportunity has appeared to ask directly the chairman of the board of the new Union of Scientific and Engineering Societies a question which worries the readers of NTR:

"Tell us, how will the union begin to support the professional activity of the researcher, who is elaborating in his own way problems which he himself has selected?"

A.Yu. Ishlinskiy, chairman of the Union of Scientific and Engineering Societies:

"At the congress not a stable, but a self-adjusting system of a creative union was established. True, a system that is not entirely analogous, say, to the union of writers, inasmuch as the individual members of the societies, which are a part of our union, in their overwhelming majority are professionals who work on a permanent staff.

"The mobility of this union and its dynamism and universality are based on the broadest democratic possibilities, which are so necessary for creative scientific and technical work. I completely share the anxiety of your readers about the satisfaction of the claims of researchers, especially young researchers.

"But, you will agree, against the background of the real prestige and the formed professional and material status of the scientist in our country the engineer is now suffering regrettably greatly. But, if it can be said this way, scientific and technical development, permit me to note, has two wings—the scientific and the engineering wings. To strengthen the engineering wing, unfortunately, as it has turned out today, is the most acute necessity.

"That is why we were worried most of all about this during these days. However, I am confident that the question posed by you will also not disappear from the field of view of the societies that are a part of our union. And I do not doubt that it will find more and more acceptable solutions."

7807

New Agency Created for Scientific-Technical Progress Control

18140250 Moscow SOVETSKAYA ROSSIYA in Russian 29 Mar 88 p 1

[Interview of engineer Igor Mikhayhlovich Yashin, secretary of the USSR Union of Scientific and Engineering Societies, by M. Komarovskiy: "Inspiration and Cost Accounting;" letter and first paragraph are source introduction]

[Text] "At the recently held 7th All-Union Congress of Scientific and Technical Societies, a decision was adopted on establishing a new creative union—the USSR Union of Scientific and Engineering Societies. What made such a measure necessary? Would not the result be as has already happened many times that the nameplate will change but everything will essentially remain as before? In the final analysis, inventors, engineers and scientists do not care who will help them—the scientific and technical society or the new union. The important thing is for help to be effective and aimed at the acceleration of scientific and technical progress. But so far we have not felt it at all.

N. Chernyayev, scientific associate Moscow."

We hve asked I.M. Yashin, secretary of the new union's board to answer the letter's author.

[Answer] Scientific and technical societies are doing much for the development of production. Each year they develop and turn over more than a million different proposals for use in the national economy and take part in the solution of serious state problems. They have developed a technology of comprehensive use of ferrous-metallurgy slag, corrosion inhibitors for the petrochemical industry and new antifriction self-lubricating plastics. These innovations have already produced an effect in production worth many millions.

But of late a discrepancy in the forms and methods of work of scientific and technical societies relating to the needs of scientific and technical progress and the rate of acceleration of development of the country's economy has become increasingly more apparent. Now the chief aim of many organizations is only indicators—growth of the size of members and increase in the number of held conferences, meetings and discussions.

The practical results of the work of a number of organizations and societies, for example, in Maritime and Stavropol krays and Chita Oblast, simply cannot stand up against any criticism. Inaction is often covered up. Of course, replacement of enterprise with the appearance of activity and the absence of any real returns cannot help but affect the prestige of scientific and technical societies.

At the present time, when radical changes are taking place in the life of the country, an acute need has arisen for awakening the enthusiasm of the scientific and technical intelligentsia and for maximally using the tremendous intellectual capabilities of innovators. For this reason, the creation of the USSR Union of Scientific and Engineering Societies is not just the replacement of a nameplate. The new organization is bound to become the foundation of a public system of control of scientific and technical progress that presupposes broad participation of scientists and engineers in the solution of questions of development of science, technology and production, satisfaction of their creative and professional interests, public discussion of the scientific and technical policy of economic organs and public control over the realization of adopted programs.

[Question] Such a reorientation of scientific and technical societies evidently will require a serious reorganization of the forms and methods of work of scientific and technical societies?

[Answer] Yes, life itself has determined the new approaches. Here is one of them. In Moscow, Kharkov, Kazan and Penza, scientific and technical societies are establishing temporary creative collectives for uniting specialists in the solution of concrete production problems. They work according to cost-accounting principles on contracts with enterprises for many of which, especially the small ones, such cooperation has become practically the only possibility of developing new technology, establishing the production of modern products and modernizing equipment. Last year, the effect of realization of developments of temporary collectives amounted to several million rubles.

In many of the country's regions, cost-accounting centers have been opened for scientific and technical services. In the course of an incomplete year of operation, one such center alone—attached to the Moscow City Council of Scientific and Technical Societies—completed more than 30 orders of the city's enterprises and organizations. They include those that are not considered prestigious but extremely necessary to city plans for modernization of schools and institutions in regard to health care, culture and the municipal- and personal-services sphere.

Cost-accounting centers have the possibility of accomplishing promising scientific-research and design themes without a specific client. These operations are financed from their own risk fund. But cost accounting, as we know, teaches one to take risks intelligently and justifiably. The result is that the centers are undertaking to provide advances for the realization of ideas promising big economic and social gains. These include, for example, the design of a system for laying road pavements whose productivity according to estimates will grow three- to fourfold compared to existing machines.

Now one of the basic principles of the work of scientific and technical societies is to be self-support. Whereas formerly they primarily existed on the basis of membership dues, now they have the right to earn their own money and use it as they see fit without stringent control from above.

The limited experience so far of temporary creative collectives and centers of scientific and technical services has shown that work in them is performed two to three times more quickly than at specialized scientific-research and planning organizations, it even costs several-fold less dearly.

[Question] Igor Mikhaylovich! It is well known that many highly effective inventions necessary for the national economy are halted in their development at the introduction stage. It becomes especially difficult for an individual inventor to "break through," although quite frequently a talented person succeeds in accomplishing that which entire institutes unsuccessfully are desperately trying to do. What aid can the Union of Scientific and Engineering Societies provide to inventors and innovators for the introduction of their developments?

[Answer] Actually, many inventions gather dust on shelves for years and decades, although their use in production could provide an appreciable effect. One of the chief reasons for this is narrow departmentalism and a reluctance to use other people's developments.

In order to get going, we recently adopted a decision on the creation of public consulting offices under central and local governments, regional soviets and certain primary organizations whose functions would include a qualified assessment of inventors' and innovators' proposals and a resolution of the question of the possibility of their use in the national economy. The first practical results of such work have already been forthcoming. For example, A.D. Rafeyenko, a brigade leader of the emergency repair service of the city housing administration, turned to the consulting office attached to the Kaliningrad Oblast Council of Scientific and Technical Societies. Over the course of many years he had tried unsuccessfully to introduce several of his inventions, which included a device for automatically regulating the illumination of stairways, an electronic contact manometer for automatic regulation of water supply in heating systems and other devices offering significant economy of electric power, fuel and water as well as easing the labor of personnel of city services. The oblast council decided to organize an exhibition of these inventions and invited to it all interested organizations. After this, a specialized experimental section was created under the oblast administration of housing and municipal services for the development and introduction of technical innovations which were headed by the author himself, that is A.D. Rafeyenko.

Public consulting offices have to solve the problem in reverse: on the request of enterprises to look for inventors or engineering collectives who are ready to provide concrete scientific and technical assistance to production. Let us say that specialists of the Vologda-1 Electric-Locomotive Depot, having run into a problem with heating electric motors in the course of maintenance of electric locomotives, turn to the consulting office of the Vologda Oblast Council of Scientific and Technical Societies. The public consulting office has involved in this work staff members of the Department of Heat Engineering of the Vologda Polytechnic Institute who developed the required unit and fabricated an experimental model of it.

Competitive selection of designs is very important for the solution of scientific and technical problems. Only a broad discussion of proposed solutions and a comparison of the pluses and minuses of different variants can ensure a fast rate of moving ahead. In this sense, the experiment conducted by us together with Central Television in the showing of "An Idea Is Needed" is most significant. It was proposed to television viewers to find a method of discharging mazut from railroad tank cars at low temperatures. This problem is of major national-economic importance. Solely because of above-norm layovers of tank cars in the wintertime, the state loses annually almost 50 million rubles.

The results of the television competition exceeded all expectations. We received 14,000 proposals among which there were many promising solutions.

This example convincingly shows what a vast potential for scientific and technical ideas exists in our country and how many talented scientists, engineers and inventors have been yearning for vital, creative work.

[Question] What societies will be included in the new creative union?

[Answer] So far the union includes 24 scientific and technical societies that formerly operated within the framework of the All-Union Council of Scientific and Technical Socieities. Altogether they unite approximately 13 million persons—engineers, scientists and innovators of production. Another two societies are now being created—for the aviation industry and for information science and computer technology. Furthermore, the question is being discussed of having certain scientific societies of the USSR Academy of Sciences, the Medico-Technical Society and others join the union. But I repeat once more that we are interested not so much in the number of societies included in the union as in practical results and effectiveness of their work. Such an approach is dictated by the radical economic reform.

7697

Preparations for Conversion to Cost Accounting

18140174 NTR: PROBLEMY I RESHENIYA in Russian No 24 22-31 Dec 87 pp 1-4

[Article by Professor A. Milyukov, doctor of Economic Sciences: "Going on to Cost Accounting"]

[Text] **Only a few days remain until 1988 begins and the USSR Law on State Enterprises (Associations) goes into effect. From that time on, economic methods of management, full cost accounting and self-financing acquire legal force. Starting on 1 January more than 60 percent of industrial output will be produced by enterprises working under these principles.**

This year it is as if we were practicing for the work expected of us. Five ministries, including 3 involved in machinery building, were on full cost accounting and self-financing. During 1988-1989 the transition to the new conditions should be completed.

Usually when one talks about how enterprises have already been working on full cost accounting and self-financing there are questions about the results. There is scepticism in the press and some speeches. Of course, we expect considerably greater returns from full cost accounting. It must be kept in mind that enterprises still do not have all the possibilities provided for by the Law, nevertheless there have already been positive tendencies. During January-September contracted deliveries were 95.8 percent met for machine building as a whole, and 97.3 percent met for those ministries on cost accounting. Each month this gap is increasing in favor of those converted to full cost accounting. The growth rates in labor productivity were: 103 percent for the whole sector, 103.6 percent for the 3 ministries; the growth rates in profits were 106.4 and 112.5 percent respectively. However, the most important conclusion drawn when one becomes acquainted with the processes occuring in enterprises on cost accounting involves the qualitative changes. They are very seriously and thoughtfully starting to calculate and to engage in economics.

The reform is impossible without a thoughtful, painstaking labor collective. Many are still waiting assurance that, as before, simply by showing up at work they will be paid. They are deluded to hope that "everything is getting easier" and that they won't be left without pay. Both panic and euphoria can hinder the main thing—the realistic vision of the turnaround we are all approaching.

Above all, we must understand that full cost accounting, no matter how well thought out and, in particular, how well covered by the Law on Enterprises and other documents, cannot be implemented instantaneously. Time is required to comprehensively and methodically work out the entire system. It is also necessary to teach cadre to understand the operation of the new mechanism thoroughly and fundamentally. Also, this mechanism began under existing conditions of operating and the existing five-year plan. This must be taken into account.

Traditionally, in making an economic analysis there is an examination of relationships in three areas: between enterprises and the state, among enterprises and between workers and enterprises. What are the specific changes in each of these three areas, what is being obtained and what is not?

What impact should the state have on enterprise activities? There was an especially stormy dispute over this question during the discussion of the draft to the Law on State Enterprises. These paragraphs were radically changed in favor of further democratization when the Law was approved.

The decree includes economic methods for managing enterprises, primarily with the help of control figures. Control figures include the following indicators: growth in production, profits, growth in labor productivity, summary indicators for technical progress (as a rule output modernization), foreign exchange earnings, development of the social sphere. They are specific for each sector.

How do control figures differ from traditionally used plan categories? First, they are compiled only for the five-year plan, annual control figures are not reapproved for an enterprise. Second, they do not have a directive nature. Control figures orient enterprise activity and assure the maintenance of economic proportions. In other words, they are a unique guarantee of crisis-free, steady development.

During the current five-year plan we will not succeed in fully using this scheme, as we are already part way down the road, while control figures are approved ahead of time. It was decided that for the remaining three years the role of control figures would be performed by five-year plan indicators. An enterprise's five-year plan assignments are its control figures and its initial data for planning.

The second tool to assist the state in influencing enterprise activity is state orders. What are these, are they simply a repeat of previously planned assortment. It appears that it would be more accurate to characterize them as a new economic tool. State orders are mandatory state assignments, but assignments of a special type. Above all, state orders are for the production of the most important types of products. They are made for the introduction of capacity using state capital investments. State orders give the producer an economic advantage. They also create responsibility on the part of the organ giving the order. This is the current concept of state orders.

Why are there so many articles in the press criticizing state orders? It seems to me that now it is impossible to realize all the conditions, especially economic responsibility for orders and economic incentives for their fulfillment. The mechanism will be worked out from month to monty and from year to year. I think that by the 13th Five-Year Plan there will be a normal system of state orders.

The distribution of income is an important question in relations between enterprises and the state. Self-financing means that each enterprise should be engaged not only in simple reproduction, but also expanded reproduction using its own resources. Of course, there is the reservation that large units of general state importance are supported through centralized sources. Furthermore, enterprises use their earnings to pay for labor and social development.

In all 20 ministries which are going on cost accounting in 1988, their own resources account for 48 percent of capital investments, with state capital investments accounting for the rest. If one compares them with ministries which were converted previously, one notes a strong shift in favor of centralized state investments. It was initially assumed that all depreciation deductions would remain at the enterprise's disposal. However, enterprises are at various development stages and it would be unjustified for them to remain at the disposal of the newest enterprises. It is important what part of the 48 percent is centralized by the ministry into its own funds. If it is a large part, it may disrupt cost accounting itself.

The problem of economic normatives, that is, the division of income, has become very acute. Unfortunately, economic science has farmed this question out to the agencies. As far as five-year plan normatives are concerned, they have already been determined for this five-year plan. Therefore, one can only talk about preliminarily working out normatives for the next plan and having them by the end of 1988. The sole attempt to break away from tradition is the Ministry of Chemical and Petroleum Machine Building, which has worked out a scale of deductions from profits to the budget. Normatives are a declining percentage of profitability, but they decline so as to provide advantages both to the enterprise and the state. This required a lot of work. The desire to have such normatives was perhaps injurious to relations with many enterprises.

The most difficult methodological question is the one on cost accounting income. In the next few years we will take the following path: large enterprises will form wages funds according to normatives which are, as a rule, simple. Incomes are divided into a material incentives fund, production development fund and social development fund. Small enterprises, especially those which serve the public, should obviously be based on the principle of gross income: the enterprise allocates a share of its cost accounting income to pay labor. The Belorussian experiment in light industry, personal services and trade shows that the principle of residual income gives results.

As far as relations between enterprises are concerned, the main goal of structuring horizontal ties is to subordinate producers' interest to consumers'. These ties are contractual relations. The goal is to convert to wholesale trade so that enterprises can freely sell most of their output and consumers can obtain it when needed. It will take about five years to master wholesale trade. It is often asked why so long? Here are some arguments.

It is impossible to freely sell under conditions of scarce resources and state controlled prices. Also, enterprises must be converted to full cost accounting so that under wholesale trade they will understand that they purchase things with their earnings. If their is no feeling for cost accounting, wholesale trade will not take place. Furthermore, the conversion to wholesale trade should be implemented with more flexible and efficient prices. Later it will be necessary to convert all territorial supply units to cost accounting. They should have an interest in better supplying the enterprises.

A key area in economic relations is the relation between enterprises and workers. Clearly, full cost accounting dictates a strengthening of cost accounting within production operations, above all the subcontracted form of work. However, this is progressing very poorly and extremely slowly. If cost accounting does not get down to shops and sections, then, to a great extent, perestroyka will only be formal. If you then ask a worker what has happened the answer will be—nothing. This is not cost accounting.

The second direction within the enterprise is to provide resources not only for bonuses, but also for wages. Through savings in the wages fund an enterprise can introduce new wage rates and salaries. This is a new and extremely important provision.

However, our new economic management mechanism will not work properly if we do not include the main factor in accelerated development—scientific-technical progress. Each enterprise will be given direct state orders for the newest equipment and for types of technology and machinery which are very much needed by the national economy. Possibly, MNTK [Intersectoral science and technology complexes] and sectoral complexes will give orders. In addition, this will be reflected in control figures.

Much depends upon economic levers and upon the enterprises themselves. They are placed in economic competition for customers. This will be won by those who produce the newest and best. The enterprise obtains an independent source—the science and technology development fund—this is half of the investment resources at its disposal. The matter depends upon the initiative and entrepreurial skills of management in all ranks and upon the desire and ability to work. Henceforth everybody will be evaluated according to these criteria.

11574

Prices for Scientific-Technical Work

18140175 NTR: PROBLEMY I RESHENIYA in Russian No 24, 22-31 Dec 87 p 6

[Article by G.P. Ivanenko: "The Price of Scientific Work"]

[Text] *With the 1 January 1988 conversion of sectoral NII to full cost accounting and self-financing, institute economists have encountered the problem of determining contractual prices for scientific-technical work. I would like to know if there is experience in solving this problem? V. Sebezhko, chief economist, TsNIIKproyektlegkonstruktsiya [Central NII for Designing Light Weight Structures], Moscow*

G.P. Ivanenko, head of the Laboratory for the Economics and Organization of NIOKR [Scientific Research and Planning-Design Work], at VNIIzhelezobeton [Central Scientific Research Institute for Ferro-Concrete] and a candidate of economics, answers this question.

Scientific work is finally becoming a commodity, the price for which is set on a contractual basis, and not by somebody sitting at a ministry desk in charge of prices and wages. For VNIIzhelezobeton it is a question of optimal economic collaboration with more than 4,000 precast ferro-concrete plants and 600 large panel house construction enterprises. Also, more than 60 institutes in various ministries and agencies are engaged in similar work. Therefore, our commodity should be competitive and be sold at prices acceptable to customers.

How are these calculated? The methodology for price formation based upon economic effects is economically inconsistent under the new operating conditions. So, the final results from a scientific organization's activities will be developments sold to production operations, real profit and not the paper effect of "gross output."

Our economics laboratory suggests a quite simple formula to determine the contractual prices for scientific-technical output.

$$Ts = S +/- DS + K \times P$$

Where S—prime costs for work completion; +/- DS—various types of additional payments and rebates; P—total enterprise profits actually obtained from the introduction of institute developments; K—the institute's share in profits.

As can be seen from the formula, profits and profitability are not linked in the traditional manner to prime costs, so the developer has no artificial interest in increasing such costs. Also, the anti-cost nature of the prime cost calculation mechanism is strengthened by the conditions recommended by VNIIEPRANT [Not further identified]. For example, actual prime costs are 5 percent lower than planned. What is done with the savings? It was decided that if they do not exceed 10 percent they remain with the institute, if they go beyond 20 percent they are tranferred to the customer. The partners will split the savings between these two figures.

Naturally, the institute will use its own funds to compensate for cost overruns.

Such constraints teach scientists about honest partnerships with production workers.

Various sorts of additional payments and rebates "DS" are used as incentives for reducing work time, special customer requested parallel work, design, marketing and environmental protection. This eliminates arbitrary dictates by the producer.

The main source of self-financing is institute income, "KxP." How large should it be and are any limits necessary? We link institute income to total payments to the budget and the formation of the institute FES [Economic incentives fund] and to the profits an enterprise obtains. We consider it absolutely incorrect to limit profitability normatives to the income obtained. This is a gross violation of cost accounting principles. It seems to us that, in order to prevent stagnation in the institute's work, allocations from enterprise profits must not be made for more than 3-5 years. In the first year, if only small amounts of work are introduced, developers should receive up to 70 percent of the profits obtained, in the second year, up to 50 percent and in the third year, 20 percent. If developments are copied without the participation of the institute and the codeveloper, the user should, in our opinion, transfer to the developer up to 10 percent of the profits obtained during a specified period, for example, 3 years.

For so-called "ineffective" scientific-technical work, when setting plan and contractual prices one can use the above formula, but instead of the actual profits (KxP) one can include a normative for the actual profitability of scientific-technical work at the institute at the time the contract was signed (RnS). This normative can be used if there are price disagreements with superior organs, when it is impossible to fill state orders and when providing various services. This approach to price formation eliminates the differences in advantages in doing various types of work within the institute.

Upon agreement of the parties, the contractual price can be determined and paid either as a lump sum estimate, which is made when the work is received, or in the form of so-called "installment [etapnoy] prices." Then only the prime costs are paid, and institute income is formed from the actual profits at enterprises or organizations using the institute's developments. It is also possible to use mixed alternatives (upon agreement) for the formation and use of prices for scientific output.

If the work is stopped by the customer, the price of what has been done is determined and paid for according to actual production outlays.

Of course, we don't think that our price model is without shortcomings. Possibly, economists can suggest another, more scientifically based methodology. Extensive, democratic and scientifically ethical discussions of problems in price formation for scientific work seem very important to us, because the fate and dynamics of scientific-technical progress depend to a great extent upon the economic interest of the creator and user of new technology.

11574

Experience of Cost Accounting, Economic Reform

18140211 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 1, 1988 pp 4-5

Kriotekhnika, Kriogenmash Associations

[Article by Vladimir Yegorovich Kurtashin, general director of the Kriotekhnika All-Union Scientific Production Association and the Kriogenmash Scientific Production Association, under the rubric "Entering Cost Accounting" (Balashikha): "The Situation. A Note on Protocol No 33-62"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] Vladimir Yegorovich Kurtashin manages a collective of many thousands of a scientific production association, which about a year ago changed over as an experiment to full cost accounting. Since then the general director has been keeping his own notes, a fragment from which he kindly placed at the disposal of our editorial board.

Tuesday, 9 December 1986. There remain 22 days to the changeover of our all-union scientific production association to the conditions of cost accounting. Today the Working Group for the Improvement of Management, Planning, and the Economic Mechanism in the Sector of Chemical Machine Building of the USSR State Planning Committee is meeting at the Kriogenmash Scientific Production Association.

As they say, we brought the fire of this check upon ourselves. What induced such a step?

We have the custom production of mainly single-design items of our own design. For the greater part they are not liable to certification for the Emblem of Quality and, accordingly, are not stimulated by monetary markups. Up to 60 percent of the products list is updated here annually. The standard profitability of such output is limited by directive to 20 percent. All this paralyzes the possibilities of reducing the production cost. The material incentive fund (FMP) has thus been established here at a lower level than the sectorial level.

Under "economic contractual conditions" the Ministry of Chemical and Petroleum Machine Building corrected this misalignment at the expense of sectorial centralized funds. This made it possible to stimulate quite intensive technical progress in cryogenic production.

The conditions of cost accounting cut off the channel of ministerial bonus grants. And also subtracted them from the base economic stimulation fund, on which the calculation of the standard of the material incentive fund is now based.

The already achieved level of our products, not to mention their further scientific and technical improvement, was threatened.

None of the factors, which predetermined the critically formed situation, was dependent on the collective of the Kriogenmash Scientific Production Association. However, neither its council, the management, nor all the personnel could tolerate so unexpected a threat of the loss of their leading position in the area of the designing and production of cryogenic equipment, which had been gained not only in the country, but also to a substantial extent on the world market.

And we went with this question to our sector. It is impossible to say that at the sectorial headquarters they did not understand us. But for the Ministry of Chemical and Petroleum Machine Building the very principle of the formation of standards of the deduction from the profit for the funds of enterprises—from the base—also was inviolable.

We had to go to the USSR State Planning Committee. Yu.M. Andrianov, chief of the then Department of Petroleum and Chemical Machine Building (he also headed the Working Group which came to us in Balashikha that day), appreciated the nontrivial situation that had formed here. It also found thorough understanding from Deputy Chairman of the USSR State Planning Committee Academician S.A. Sitaryan.

Here they immediately rejected the "office desk settlement" of our question. They formed the representative Working Group. In all 17 experts—workers of the State Planning Committee and scientists—became members of it. They also enlisted representatives of the central committee of the sectorial trade union and the Ministry of Chemical and Petroleum Machine Building. They came, once again, not to meet, but, as they say, to check head-on our readiness for the changeover to full cost accounting.

We were confident of our calculations and conclusions, on the basis of which we raised the question of the standard of the deduction for the material incentive fund. We also did not have doubts about the readiness of the entire Kriotekhnika All-Union Scientific Production Association as a whole and its main scientific production

association—the Kriogenmash Scientific Production Association—for the changeover to cost accounting. Therefore, we did not expect surprises.

However, the thoroughness of the check, which was undertaken by the Working Group prior to the meeting, proved to be not at all as could have been expected. It encompassed not only the economic services, but also the majority of other services of management, the sections, bays, and shops of the plant, and the subdivisions of the scientific research institute. As a result in Protocol No 33-62 the following notes appeared:

"The Working Group noted that along with a large amount of its own design development and the rapid introduction of cryogenic equipment in production at the enterprise the amount of manual work is large, especially in assembly and welding operations. In the shops there are too few means of the automation and mechanization of labor, which testifies to the necessity of the optimization of the ratio of designers of items and designer-process engineers for the designing of means of mechanization and automation....

"The Ministry of Chemical and Petroleum Machine Building (Comrade Shein) and the Kriogenmash Scientific Production Association (Comrade Kurtashin) are to take steps on the strengthening of the technological services of the scientific production association and the introduction in production of means of the mechanization and automation of their own development."

The question raised by us was also settled: the standard of the deductions from the profit, which is left at the disposal of the association, for the material incentive fund was increased by 2.9 percent. The suggestion "on the establishment for items of one-time production, which are being newly produced by the Kriogenmash Scientific Production Association, of the standard of profitability, which is planned for the entire Kriotekhnika All-Union Scientific Production Association," was submitted to the USSR State Committee on Prices. Thus, it became a matter of its increase by approximately 3.5 percent.

It is impossible to say that such a decision radically changed the situation that had long been established here. We received, frankly speaking, a standard, which was rigid, but, if not optimal, all the same capable of working for the stimulation of technical progress.

Not by chance am I telling about this now, more than a year later. Those, who now, after us, are embarking on cost accounting, should know that a question of any urgency, and many of them arise beyond this threshold, can be settled. Of course, if the labor collective, its council, and management competently, responsibly, and firmly fight not for self-will, but for the genuine independence of the collective. The Law on the State Enterprise (Association), which went into effect as of the first of this month, protects precisely its independence. But there might also not be independence, if the enterprise does not have the opportunity to manage its own funds, first, for the acceleration of scientific and technical progress; second, for the strengthening of the national economy; third, for the meeting of the needs of the consumers of its products and then for the production and everyday needs of its own personnel. With respect to all this we now have an immediate duty—to exercise the rights granted by the law. They are not a gift of fate, but a weapon from the arsenal of restructuring.

If a threat to these principles arises and a careful analysis shows that its elimination is beyond the power of the collective, one must go to any level for the settlement of the question.

Just one thing is entirely unacceptable—the reckless aspiration for standards, which are "sparing," reduced, preferential, and so forth and encourage weakness.

But what if in accordance with the standards there are not enough deductions for funds from the profit, which is left to the enterprise, for other vital goals? Typical apprehensions are fed by this.

But here for some reason people rarely recall the possibilities of bank credits. The access to them is open. But one must use credit efficiently, precisely for their purpose. And repay them on time. But you will not get used to this until you give up the irrevocable nature of previous allocations from centralized funds.

I understand that just the example of the intervention of the Working Group of the USSR State Planning Committee in the settlement of a question, which had become urgent here, is not enough to defend convincingly the necessity of a sober-minded approach to standards. Here a reliable description of the effectiveness of our efforts during the 1st year of work under the conditions of full cost accounting is needed.

The changeability of our products did not decreased. On the contrary, the necessity of the development and production of fundamentally new equipment for the most priority directions of scientific and technical progress coincided with the assimilation of cost accounting conditions. Specifically, for example, we developed and produced the Bars single-design special unit for the Protvino accelerator. Work on warm, as we call it, superconductivity also fell to our lot.

Now our economic services are completing the analysis of the work of the association for 9 months of the 1st year of our "cost accounting operation." Here is one of, I would say, the integral indicators, about which it is already possible to speak firmly: the plan of deliveries in accordance with contracts of products of the Kriogenmash Scientific Production Association, including products that have been newly developed and assimilated by

production of the scientific production association, was fulfilled by 100 percent. Moreover, we derived an above-plan profit of more than 2 million rubles.

Thus, the standards of deductions from the profit for the material incentive fund work both in the interests of consumers and in our interests.

Price Reform

[Article by First Deputy Chairman of the USSR State Committee on Prices A. Komin under the rubric "Entering Cost Accounting": "Real and Imaginary Prices"]

[Text] In recent times much has been said and written about prices and pricing. And this is understandable: the implementation of the economic reform, which is so urgently needed by the national economy, cannot but also affect the mechanism of pricing. There are many reasons, for which such steps in the economy became urgent long ago. As confirmation I will cite just one, in my opinion, very significant fact. In the 1980's labor productivity of the CEMA member countries increased by 19 percent, while that of the EEC countries increased by 17 percent. But here the capital investments of the CEMA member countries increased by 22 percent, while those of the EEC countries increased by only 1 percent! As is evident from the comparison, we are losing significantly in the effectiveness of the use of available assets. And this is just one aspect of the problem of the lag. That is why precisely a leap, a sharp turn toward new principles of the management of the socialist economy is necessary. We have to change fundamentally our economic mechanism and to change over from so-called administrative command methods of management to economic methods.

The formed system of prices also does not conform to the principles of the restructuring of the economy—it is like a barrier in the way of further restructuring. The thesis that under socialism prices should decrease with the decrease of the production cost and the increase of labor productivity proved to be mistaken. In practice this invented law was never fulfilled. If we take, for example, the 1930's, during the period from 1920 to 1940 the level of state retail prices was increased by 6.2-fold. The prices for foodstuffs increased by four- to sixfold, the prices for nonfood consumer items were increased to a smaller degree.

True, during the postwar period (from 1949 to 1954) a decrease of prices occurred in our country. Everyone remembers this, but hardly anyone knows how this was. But the "economic miracle" was created by the reality of that situation. In 1947 a monetary reform and a price reform were carried out simultaneously. Here as compared with 1940 prices increased by threefold. Then a policy of reducing prices was adopted. But at the same time a state loan from the population was announced every year for approximately the same amount by which prices were reduced.

In all the last 30 years the potential of an increase of prices has accumulated in the system of pricing. Moreover, a distortion in the ratios between retail and purchase prices has occurred. For example, whereas in 1952 wheat flour sold at a price of 34 kopecks a kilogram, kolkhozes were paid 1 kopeck a kilogram for the wheat. (Today they are paid 13 kopecks.) A kilogram of meat in 1952 sold on the average for 1 ruble 48 kopecks a kilogram, while kolkhozes were paid 23 kopecks a kilogram (now we pay 5 rubles 40 kopecks). Milk sold for 22 kopecks a liter, kolkhozes were paid 2.8 kopecks. (Today we are already paying 45 kopecks.)

In the past 30 years the prices for petroleum have increased by 3.7-fold, coal—twofold, metal—twofold, lumber—threefold.... But even such an increase of prices does not reflect the present expenditures in the fuel and power complex. We have become surrounded by subsidies, the amount of which has increased from 3.5 billion rubles (in 1965) to 84 billion rubles at present. I believe that without comments it is also clear what this means.

At present different versions of the solution of the problem are being considered: the increase of prices, subsidies to the population, which are connected with this, methods of compensation, and so on. For this budget surveys are being made, the necessary data are being gathered and analyzed....

It is planned to carry out the reform of the entire system by the start of the next five-year plan. When specific proposals on retail prices have been prepared, they will be published for national discussion. No increase of prices for some industrial goods or others and for food products will occur without this. The reform of pricing will be carried out under the conditions of glasnost. This will help to avoid mistakes and excesses and to take into account the interests of the majority.

Hungarian Tax, Price Reform

[Article by Candidates of Economic Sciences S. Abramov and I. Oleynik under the rubric "Experience": "The Hungarian Model"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] How is the efficiency of unprofitable enterprises and enterprises with a low profitability to be increased? To what will the reform of the tax system and the system of pricing lead? These and other innovations in the economic mechanism of Hungary were at the center of attention of the regular meeting of the Soviet-Hungarian Commission of Economic Scholars, which was held at the end of last year in Tallinn.

As was noted at the seminar, the necessity of the improvement in Hungary of the economic mechanism is due to the realization of a number of blunders in the management of the economy of the country in the 1970's. The main one of them is the inconsistency in the implementation of the ideas of the radical economic reform of 1966-1968, that is, numerous compromises and attempts to improve the directive command system of management, by having simply "incorporated" in it several market regulators.

Among the most important "barriers," which it was not possible to overcoming in the way of the improvement of the economic mechanism, Hungarian specialists named the inadequate influence of the law of value and the law of supply and demand on the process of making economic decisions; the groundlessness of plans and the continuing interference of organs of state management in the economic activity of enterprises; the possibility of improving the results of the management of enterprises by the overstatement of prices and state grants and subsidies.

Direct interference in the economic activity of enterprises will be sharply restricted. As a result the plan will become a guiding, and not a directive document. It will be oriented toward the use of not administrative instructions, but economic regulators—credit and tax levers, will not limit initiative, but will stimulate its display and development.

The tax system will also be changed. Starting in 1988 instead of numerous deductions and taxes, which are collected from enterprises and workers, only three taxes are being introduced—the general turnover tax for state enterprises and cooperatives, a unified income tax for the population, and a so-called business tax for individual citizens and associations, which are busy within the framework of individual labor activity.

Instead of a large number of tax rates all goods are broken down into three categories—with an assessment of 0, 15, and 20 percent. The last one applies to the majority of goods and services, the first one applies to products, the prices for which are now subsidized, and one in the middle applies to everything else.

According to rough estimates, as a result of the tax reform approximately 75 percent of the enterprises will retain or strengthen their financial situation. At the same time for unprofitable enterprises and enterprises with a low profitability the situation may worsen appreciably. Here the attitude toward such enterprises is becoming more rigid. The practice of closing insolvent organizations with the selling off of their property and the placement of dismissed people at more profitable works will be used more extensively.

Starting in 1988 more than 80 percent of the goods will be sold at prices which have been established on the basis of supply and demand. The level of wholesale and retail prices will change, since a significant portion of the state grants will be eliminated. The prices for the basic types of foodstuffs, raw materials, energy carriers, and imported goods will be increased, but at the same time they will be reduced for products of the processing industry, first of all machines and equipment, and for exported products.

In connection with the tax reform and the reform of pricing there will be changes in the sphere of material and social security. Thus, it is planned to increase family allowances by 40 percent, while maternity benefits will increase from 4,000 to 6,000 forints. Moreover, taxes will not be collected from pension payments.

Economic Consultation Center

[Article by V. Baronin: "Nonsense by Instruction"]

[Text] Much has been said about the life without rights in the past of industrial enterprises, construction projects, scientific research institutes, and design bureaus. Indeed, they fulfilled at times incompetent orders, did not have the opportunity also to take a set without approval "from above," and so on and so forth.

But this is just one side of the coin. If we look more closely at the other, it is possible to notice that these enterprises had the opportunity without particular pomp to demonstrate very insolent behavior: to wreck plans, to turn over buildings without roofs, to issue for a scientific product fat reports, the content of which was worth no more than the paper that was used for writing them.

Now new times have come, and, as they say, the new days require new songs. Independence, self-support [samookupayemost], self-financing...they need to settle and do everything themselves. If you produced a good product, you will obtain money for it, if you did hack work in production or science, you went bust, and there will no longer be an opportunity to plead that they ordered you to do a foolish thing. You have an entire package of rights and all the responsibility.

Is this good or bad? It depends. For those, who wanted and knew how to work, it is good. For those, who simulated activity, it is bad. But these are the extremes. Between them there are a large number of people, who do not know how to work in the new way and should master this art literally on the run. Does such a desire exist? It seems to me that it does.

On 24 April the small announcement that the Moscow Institute of the National Economy imeni G.V. Plekhanov had organized an economic consultation center, was published in the newspaper VECHERNAYA GAZETA. This was Friday, while on Saturday calls from 30 different organizations were made to the dean's office of the Moscow Institute of the National Economy imeni G.V. Plekhanov. Hence, a need for knowledge exists, a desire to learn to work in the new way also exists.

It must be said that the interaction of science and production and of an institute with an enterprise is not a new phenomenon. If you—the enterprise—need to study the question of the advisability of organizing an automated control system for the management of the movement of commodity stocks at a large construction site, please, so-called economic contractual themes are at your service. If you invest 20,000-25,000 rubles and wait 2-3 years, you will receive a qualified response and a study of 2-3 versions of the solution of your problem. The consultation center works differently. First, the contract for it is concluded for not more than 3 months, second, scientific service is one-tenth as expensive. Its price is formed from the daily rate of the consultant, who works during his free time, travel expenses, the cost of machine time, 17 percent of the overhead, and 20 percent of the profit of the center, which is calculated on the basis of the sum of all the expenditures.

The Construction Administration of the Estonskaya GRES, for example, needed to study the nature and structure of management tasks and to develop a technology of their automated accomplishment—Candidate of Economic Sciences Yu.A. Belyayev went to the facility. In full conformity with the contract in 15 days the necessary work was done, while the essence of the suggestions was published in two issues of the factory newspaper STROITEL ESTONSKOY GRES. The Construction Administration paid 602 rubles 40 kopecks for all the work.

Since the organization of the economic consultation center 8 months have passed. The period in general is short. But it contained the conclusion of 49 contracts with enterprises of industry, trade, and public dining, scientific research institutes and design bureaus, the agroindustrial complex.... The Kirghiz Ministry of Higher and Secondary Specialized Education, the Armenian Procuracy, and the Library imeni Lenin used the service of the capital higher educational institution. Just recently an order for economic consultation was received from the Hungarian Ministry of Health. Why by the Moscow Institute of the National Economy imeni G.V. Plekhanov, and not by some well-known western firm, I asked Professor V.P. Fedorov, manager of the center?

"The service of, for example, American firms will cost very much, what a single flight of specialists costs! Our consultation will cost many fold less. As for quality, within the center there are 12 professors and doctors of sciences, 32 docents and candidates of sciences, moreover, each of them has abundant experience of work with enterprises of industry and agriculture, scientific research institutes, design bureaus, and organs of state management."

The Moscow Institute of the National Economy imeni G.V. Plekhanov has begun a useful and needed business. Today, when at every enterprise and in every unit of the national economy it is necessary to elaborate the optimum version of economic behavior, consultations of scientists, qualified and prompt consultations, are simply necessary. Restructuring is an extremely serious matter, the trial and error method is no longer suitable for its vigorous implementation. New forms and methods are needed.

Incidentally, at the Moscow Institute of the National Economy imeni G.V. Plekhanov, which organized the economic consultation center, they are also working on finding them. In early December of last year a school of managers with a term of instrument of a week to a month was organized here.

The school operates evenings and on Saturdays. Moreover, you might not wait to find out whether or not the enterprise, at which you work, will send you: you can receive the necessary training at your own expense. And compile the program of instruction jointly with scientists in order to obtain precisely the knowledge that you need.

Within the framework of normal logic and normal economic life, having written these lines, it remains merely to get the telephone number of the institute, the center, or the school. It is easy to do this, but the trouble is, will we be misleading the reader? Normal economic life is just making its way in life.

The same consultation center cannot pay for the labor of scientists, there is no instruction which permits that, but there is a prohibiting one. And an enterprise cannot do this. It can use only a tiny so-called solitary fund, of which, of course, there is not enough for serious economic consultation.

The circle is closed. In order to break it somehow, the Moscow Institute of the National Economy imeni G.V. Plekhanov is sending letters to the USSR Ministry of Higher and Secondary Specialized Education and the Ministry of Finance with the request to recognize the rewards, which are received by specialists, as honorariums. In this case the restrictions on the wage do not apply to them. In essence it is a question of granting the institute the right to pay the money, which has been earned by scientists and has been transferred to its current account by enterprises and organizations, from its own cashier's office.

Like the reader, the author of these lines would like very much to know what will triumph—common sense, the logic of truly economic behavior, or a document, which thus far they have not gotten around to repealing.

You can obtain information on the outcome of this contradiction and any information on the center and the school of managers by calling Olga Fedorovna Demidova, who is the scientific secretary of the center, at 237-85-09.

Course on Cost Accounting, Self-Financing

[Article by Candidate of Historical Sciences A.T. Stepanishchev under the rubric "We Are Studying the Economics of Restructuring": "The Logic of the Retrospect"; first three paragraphs are NTR: PROBLEMY I RESHENIYA introduction]

[Text] Today to be economically literate is not only a necessity, but also a duty of every citizen of our country. Otherwise the appeal "every worker is the master at his workplace" will become a useless slogan.

To give workers the necessary economic knowledge—the system of economic education is also aimed at this. One of the most urgent themes is "The Full Cost Accounting and Self-Financing of Enterprises and Organizations."

Candidate of Historical Sciences A.T. Stepanishchev tells about the peculiarities of the conducting of lessons on this theme as applied to the work of scientific research institutes and design bureaus.

I would begin the lesson with the posing for the students of a logical assignment on Lenin's work "On the 4th Anniversary of the October Revolution."

V.I. Lenin writes about the necessity of teaching flexibility and the ability "to change quickly and drastically one's tactics, taking into account the changed objective conditions and choosing another means to our goal, if the former means proved to be inadvisable and impossible for the given period of time." Demonstrate on the basis of the changeover of your organization to cost accounting methods of work that this is also "a change of tactics," "the choice of another means."

Why should "...strong bridges which lead...to socialism" be based precisely on cost accounting?

In the work "A Draft of Theses on the Role and Tasks of Trade Unions" V.I. Lenin regards the changeover of enterprises to cost accounting as a necessary condition of the development of the economy of the young Soviet Republic. He also noted that the introduction of cost accounting and the circumstances, which follow from this, inevitably give rise to "a certain opposition of interests between the working mass and the directors, who manage state enterprises or departments, to which they belong."

It is quite possible that such an "opposition" will also arise in case of the introduction of cost accounting in your labor collective. For example: your scientific research institute (design bureau) is changing over to cost accounting. However, the state orders on the development of science and technology will be specified and reported to it by ministries and departments (from above). Will the interests and possibilities of the scientific organization always be compatible with the content of the state orders? Is not the principle of the independence of institutes violated here, for some points of the orders may come into conflict with the possibilities and needs, which exist at the scientific research institute (design bureau)? If conflict situations will emerge on this basis, what, in your opinion, are the means of their resolution?

In the telegram to G.Ya. Sokolnikov V.I. Lenin notes that under the conditions of cost accounting trusts and enterprises themselves are responsible for the operation of their organizations without a loss and can together with members of the board be taken to court, be imprisoned, have property confiscated, and so on. But what kind of steps, in your opinion, is it necessary to take against a bankrupt scientific organization?

As we see, cost accounting in the socialist economy got its start back at the dawn of Soviet power. The propagandist can invite the audience to analyze the reasons why it did not find proper development in the past. Hence the question, what are the present prerequisites of the successful changeover to science to economic methods of management?

An extensive list of literature on this lesson is cited in the model syllabus of the course "The Acceleration of Scientific and Technical Progress Is the Basis of the Intensive Development of the Economy." But, I believe, it is useful for propagandists and students to familiarize themselves in addition with the following publications:

Lenin, V.I., "On the 4th Anniversary of the October Revolution," "Poln. sobr. soch." [Complete Works], Vol 44, p 151.

Lenin, V.I., "A Draft of Theses on the Role and Tasks of Trade Unions," "Poln. sobr. soch.," Vol 44, pp 342-343.

Lenin, V.I., "To G.Ya. Sokolnikov," "Poln. sobr. soch.," Vol 54, pp 150-151.

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Decree on Changeover of Science to Cost Accounting, Self-Financing

18140157 Moscow SOBRANIYE POSTANOVLENIY PRAVITELSTVA SOYUZA SOVETSKIKH SOTSIALISTICHESKIKH RESPUBLIK in Russian No 48, 1987 pp 1011-1024

[Decree No 1102 of the CPSU Central Committee and the USSR Council of Ministers of 30 September 1987, "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing"]

[Text]

Article 158. On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing

The CPSU Central Committee and the USSR Council of Ministers note that the consistent pursuit of the policy of the 27th party congress of the acceleration of socioeconomic development requires the utmost increase of the pace and the maximum use of the achievement of scientific and technical progress and the radical restructuring of the activity of scientific research, planning, design, and technological organizations.

The scientific and technical potential, which has been created in the country and makes it possible to accomplish important national economic tasks, is not being used effectively enough. A lag in a number of most important scientific directions has been allowed, the leading development of science and technology with allowance made for the scientific and technical revolution, which is occurring in the world, is not being ensured.

The development of science has been accomplished in recent times not by the increase of the efficiency of the activity of scientific organizations, but mainly due to the establishment of new institutions and the increase of the number of their personnel. The level and quality of scientific research and development often do not conform to the present scientific and technical requirements and to the prospects of development of the national economy.

The activity of many institutes and planning and design organizations does not have a substantial influence on the increase of the technical level of production, the dispersal of forces and assets for the performance of operations, which are of neither scientific nor practical value, is being allowed.

The proper responsibility and interest of scientific collectives in the accomplishment of the tasks facing them and in high results of the research being conducted are lacking. Creativity and initiative and the search for new nontraditional solutions are being poorly stimulated.

The methods of management of scientific organizations have become obsolete and rely mainly on administration by mere decree and directivity. The economic approach to the management of science is not being used, the necessary dependence between the revenues of collectives and the results of research is lacking.

The formed methods of management at scientific organizations and the practice of their interrelations with clients, as well as with superior organs of management do not satisfy the present requirements. They are not ensuring the proper responsibility for the technical level, quality, and rate of updating of products and for the decrease of expenditures and the time of development of new equipment, technology, and materials. The system of planning, financing, and economic stimulation at scientific organizations is poorly linked with the interests of enterprises and is not aimed at the achievement of high end results of production.

The USSR State Committee for Science and Technology, the USSR Academy of Sciences, USSR ministries and departments, and the councils of ministers of the union republics in their practical activity have tolerated a low technical level of the scientific research and development, which are being conducted, are not ensuring the concentration of the forces and resources of scientific organizations on the priority directions of scientific and technical progress, which make it possible to bring the national economy to leading positions in the world, are not carrying out the necessary monitoring of the activity of subordinate scientific research and planning and design organizations, and often keep them busy with work on the drawing up of all kinds of references, reports, and papers.

For the purposes of the radical improvement of the activity of scientific research, planning, design, and technological organizations, the increase of their role and responsibility in the accomplishment of the tasks of the acceleration of scientific and technical progress, and the increase of the efficiency of social production and to execute the decisions of the June (1987) CPSU Central Committee Plenum on the carrying out of scientific research and development on the basis of the principles of cost accounting and self-financing the CPSU Central Committee and the USSR Council of Ministers resolve:

1. To consider it necessary to accomplish the changeover to full cost accounting and self-financing of scientific research, planning, design, and technological organizations (hereinafter called "scientific organizations"), using the new economic mechanism in science and scientific service as the main economic lever of the acceleration of scientific and technical progress in the national economy and the basis of the vital activity of the collectives of these organizations. To proceed from the fact that their activity should be carried out in conformity with the provisions of the USSR Law on the State Enterprise (Association).

2. To establish that the consistent implementation of the strategic policy of the party of the acceleration of the socioeconomic development of the national economy, the assurance of leading levels in scientific and technical progress, the complete mobilization of the scientific potential, and the creation of an atmosphere of creativity in scientific collectives are the main task of scientific organizations under the new conditions of management.

To devote foremost attention to the strengthening of the contacts of science with production, to envisage the direct inclusion of scientific collectives in operations on the entire "scientific research, development—production—marketing—service" cycle. To increase the pace and level of research in all directions of the development

of Soviet science and technology, to increase sharply the practical return of the labor of scientists, designers, and process engineers. To ensure the constant readiness of science for the realization of the requirements of present-day life and the practice of the revolutionary changes, which are occurring in the country, and for the attainment of the world technical level of production and product quality.

To develop actively the priority directions of scientific and technical progress, to ensure the completion of the work on state scientific and technical goal programs and the plans of interbranch scientific technical complexes, to speed up in practice the development of fundamentally new equipment, technology, and materials, which revolutionize production and make it possible to ensure the highest world level and the competitive ability of the products being developed.

In the shortest time to reorganize the work of interbranch scientific technical complexes. To regard as the most important task of the scientific organizations, which support the activity of these complexes, the USSR State Planning Committee, the USSR State Committee for Science and Technology, USSR ministries and departments, and the councils of ministers of the union republics the manifold shortening of the duration of the cycle of operations on the development, assimilation, and large-scale production of highly efficient types of equipment, technology, and materials of new generations in the main directions of scientific and technical progress.

To ensure the unconditional completion of the operations, which are specified by the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, to actively develop and intensify integration and cooperation in the sphere of research and development with scientific organizations and enterprises of the socialist countries.

2. To increase the responsibility of scientific organizations for the scientific and technical level and quality of the products (operations, services), which are being produced in the national economy in accordance with their type of activity.

To use fully the extensive possibilities of the development of the initiative and enterprise of scientists and engineers, to increase substantially the quality and creative return of the intellectual personnel potential, so that the effectiveness and the recovery of the expenditures being made would become the norm of the activity and the main criterion of the evaluation of the results of the labor of both the scientific collective as a whole and each worker of it.

To establish that scientific organizations bear all of the responsibility for the realization in research and development of the long-range demands on the technical level and quality of products (operations, services), their conformity to world standards, and competitive ability. They are obliged to ensure the satisfaction of the requirements of clients, profitable work, and the meeting of obligations to the budget, banks, and superior organs.

I. The Basic Principles of the Economic Activity of Scientific Organizations

4. The USSR State Committee for Science and Technology, the USSR State Committee for Construction Affairs, the USSR State Agroindustrial Committee, USSR ministries and departments, and the councils of ministers of the union republics are to ensure the radical restructuring of the activity of scientific organizations under the new conditions of management. To proceed from the fact that scientific organizations along with production enterprises are socialist commodity producers and the principles of full cost accounting and self-financing should be the basis for their work. They ensure their own scientific, technical, and social development by means of the assets, which have been earned by the sale of developments to consumers, and bear full responsibility for the results of their own economic activity.

The scientific and technical product of scientific organizations is a commodity. Completed scientific research, planning, design, and technological operations and services, produced prototypes or test runs of items (products), which have been made in conformity with the requirements, which are stipulated in the economic contract, and have been accepted by the client, are grouped with the scientific and technical product.

5. To establish that the basic source of the scientific, technical, and social development and the material stimulation (the remuneration of labor) of the scientific organization is its profit (revenue).

To change over to the special-purpose financing of specific scientific research and planning and design operations in accordance with contracts with clients, who are interested in these operations, instead of the financing of the maintenance of the organization. Mainly the assets of associations, enterprises, and organizations, as well as the assets of the centralized funds and reserves of ministries and departments and the credits of banks and, in necessary instances, budget allocations should be the sources of financing of such operations.

6. Ministries and departments are obliged to concentrate the scientific and technical potential on the solution of important scientific and technical problems in the priority directions of scientific and technical progress and on the timely development of new equipment, technology, and materials, which in their parameters and indicators surpass the world level.

The USSR State Planning Committee and the USSR State Committee for Science and Technology jointly with the USSR State Agroindustrial Committee, the USSR State Committee for Construction Affairs, USSR ministries and departments, and the councils of ministers of the union republics are to specify the amounts of assets of the centralized funds for the development of production, science, and technology, which are being allocated for the financing of the most important sectorial scientific research and experimental design operations and economic research, which are being performed by scientific, including sectorial, organizations, for the 5-year period (with a breakdown by years), as well as for 1988-1990.

USSR ministries and departments, the USSR State Agroindustrial Committee, the USSR State Committee for Construction Affairs, and the councils of ministers of the union republics independently determine the specific themes of these operations and conclude contracts for the fulfillment.

To increase the responsibility of ministries and departments for the efficient spending of the assets of the centralized fund for the development of production, science, and technology.

USSR ministries and departments, the USSR State Committee for Construction Affairs, the USSR State Agroindustrial Committee, and the councils of ministers of the union republics are to establish strict control over the use of the assets of the centralized funds for the development of production, science, and technology, which are being allocated for the financing of research and development.

The USSR State Committee for Science and Technology, the USSR State Committee for Construction Affairs, and the USSR State Agroindustrial Committee are to make periodic checks of the actual spending of the indicated assets by ministries, departments, territorial organs, and scientific organizations and are to report on the results of these checks to the USSR Council of Ministers.

7. For the purposes of the increase of the responsibility of scientific organizations in the timely satisfaction of the requirements of clients and the increase of the role of consumers in the determination of the themes, the scientific and technical level, the quality, and the time of completion of research and development to increase radically the role of contractual relations.

To establish that the contract is the basic document which regulates the relations of the scientific organization (association) with the client of the scientific and technical product, including ministries and departments. Contracts are concluded for the performance of scientific research, planning, design, and technological operations on the development of new equipment, technology, and materials, for the production, testing, and delivery of prototypes or test runs of items (products) and their assimilation in production, for the rendering of scientific and technical services, and for the performance of other operations in accordance with the type of activity of the scientific organization.

In case of the failure to meeting the obligations, which are stipulated by the contract, the scientific organization, association, or enterprise, which is the developer, bears material liability: it returns to the client the received assets and pays fines in conformity with the conditions of the contract and prevailing legislation.

8. To implement the changeover to the payment for the scientific and technical product at contract prices. The prices for scientific research, planning, design, and technological operations, the pilot product, scientific and technical services, and other types of operations are coordinated by the scientific organization with the client before the start of the operations subject to the required efficiency, quality, and time of completion of the operations. The exceeding of the expenditures as compared with the contract price, which has been allowed by the performer without consultation with the client, is offset by him by means of his own assets.

If the work is halted through the fault of the client, it is paid for by him in accordance with the actually made expenditures with the level of profitability, which is envisaged in the price for this work.

9. To ensure the extensive introduction of competitive principles in the scientific and technical sphere, including basic research, the conducting of parallel development on the most important problems of science and technology, the elimination of the monopoly position of individual main institutes, and the utmost encouragement of the creative scientific and technical work of workers.

10. To establish that in case of the lack of clients for research and development and lengthy fruitless work of a scientific organization and in the case, when the steps taken by this organization and the superior organ on the assurance of efficient work have not yielded positive results, the scientific organization halts its activity.

II. Scientific Organizations Within Production Associations and Enterprises

11. The scientific organizations, which belong to production associations and enterprises, are obliged to ensure the increase of the technical level and the improvement of the organization of production, the perfection of technological processes, the increase of the quality, the assurance of the competitive ability of products, and their timely updating.

To aim the activity of scientific organizations mainly at the meeting of the internal needs of production associations and enterprises, while to attribute their outlays in

this case to the product cost of the association or to recover them at the expense of the assets of the fund for the development of production, science, and technology of the association.

To take into account the operations, which are performed in accordance with contracts with other enterprises and organizations, as the scientific and technical product in the overall results of the activity of production associations.

To include the profit (revenue) of the scientific organization, which belongs to a production association, in the total amount of its profit (revenue) and to distribute it in accordance with established procedure.

12. Scientific organizations operate within production associations and enterprises on cost accounting principles as structural units in conformity with the statutes on them, which are approved by the associations. They can have an individual balance sheet and individual accounts at institutions of banks.

III. Scientific Organizations Within Scientific Production Associations

13. To increase the efficiency of the work of the scientific organizations that belong to scientific production associations. To proceed from the fact that they should ensure the accomplishment of the basic tasks, which have been set for the associations on the development in the shortest time of highly efficient complexes, machines, instruments and materials, and technological processes, which govern scientific and technical progress of the sector.

The activity of the indicated scientific organizations should be aimed, as a rule, at the fulfillment of the contracts of associations with clients. Their scientific and technical product is taken into account along with the product for production engineering purposes in the overall results of the work of the scientific production association. The association plans the joint activity of the scientific and production subdivisions on the basis of the conditions of its own functioning as a unified scientific production complex. State orders on the development of science and technology can be reported to production and scientific production associations at the same time as the state order.

14. Scientific organizations operate within scientific production associations as structural units or independent organizations, which enjoy the rights that are envisaged by the USSR Law on the State Enterprise (Association).

The scientific production association supervises the independent scientific associations which belong to it, implementing with respect to them the functions of a superior organ in conformity with prevailing legislation.

IV. Scientific Organizations Which Are Directly Subordinate to Ministries and Departments

15. To establish that the scientific organizations, which are directly subordinate to ministries and departments, should ensure the conducting of research and development of a general sectorial nature and actively promote the extensive use in the sectors of the national economy of advanced technologies and new forms and methods of the management of production. They are fully responsible for the high technical level of production and the products of the sector and ensure the pursuit of a unified science and technology policy.

16. Ministries and departments are to report to the scientific organizations:

—the state orders on the development of science and technology;

—the limits of state centralized capital investments for the development of pilot experimental works, new construction and the accomplishment of especially important tasks in conformity with the list of objects, which have been included in the state plan, the amounts of construction, installation, and contracting work, and centrally distributed material and technical resources.

The amount of work is determined by the scientific organizations independently as the sum of the contracts with clients for the development, production, and delivery of new equipment, technology, and materials and the rendering of scientific and technical services.

17. The scientific organizations with the permission of the superior organ can use forms of cost accounting, which are based on the standardized distribution of the profit or revenue.

To approve for scientific organizations the following economic standards:

—the fee for fixed production capital and manpower and natural resources;

—the deductions from the accounting profit (revenue) for the state (including local) budget;

—the deductions from the accounting profit (revenue), as well as from the amortization, which is intended for the complete replacement of fixed capital, for the centralized fund for the development of production, science, and technology and the reserves of the ministry;

—the formation of the fund for scientific, technical, and social development;

—the formation of the material incentive fund and the total wage fund for scientific organizations which use a form of cost accounting, which is based on the standardized distribution of the profit;

—the formation of the fund of currency deductions.

At the scientific organizations which use a form of cost accounting, which is based on the standardized distribution of the revenue, the unified fund for the remuneration of labor is formed as the balance of the cost accounting revenue of the collective after the formation from it of the fund for scientific, technical, and social development.

The scientific organizations are to ensure the proper sequence of the distribution of the derived profit (revenue) and the direction of the use of the fund for scientific, technical, and social development and the material incentive fund (for the scientific organizations which use a form of cost accounting, which is based on the standardized distribution of the profit) in the manner that has been established for associations and enterprises of the corresponding ministries.

To grant the scientific organizations the right to use the assets of the fund for scientific, technical, and social development for the financing of basic research and operations on the creation of a scientific reserve.

18. Ministries and departments when establishing economic standards for scientific organizations:

a) are to ensure the close connection of statewide interests with the cost accounting interests of scientific organizations and the interest of the workers of these organizations in high results of labor and in a creative approach to the accomplishment of the tasks facing them;

b) are to envisage as the basic criterion of the evaluation of their activity the economic and social significance for the national economy and the effectiveness of research and development, their promise, and the scientific and technical level as compared with world achievements;

c) are to take into account the specific nature and type of scientific organizations and to increase the interest of labor collectives in the latest research, which ensures nontraditional approaches to the accomplishment of arising tasks.

V. Academic and VUZ Scientific Organizations

19. To establish that academic and VUZ scientific organizations are obliged to focus basic attention on the utmost development of basic research in the most important directions of the natural, technical, and social sciences as the basis for the steady movement of the country along the path of progress.

On the basis of these basic operations they should ensure the development of the theoretical principles for fundamentally new types of equipment and technologies, which revolutionize social production, and their quickest transfer to the national economy, as well as the performance with the participation of sectorial and plant science of basic and highly efficient applied operations of a sectorial and intersectorial nature.

20. To commission the USSR State Committee for Science and Technology jointly with the USSR Academy of Sciences to specify the procedure of the financing of basic research in the area of the social, natural, and technical sciences and operations on intersectorial scientific and technical problems of statewide importance, as well as on the development of fundamentally new equipment which revolutionizes production.

21. The USSR State Committee for Science and Technology, the USSR Academy of Sciences, and the USSR Ministry of Higher and Secondary Specialized Education are to specify the procedure and to ensure the active participation of academic and VUZ scientific organizations in the implementation of state scientific and technical goal programs of an intersectorial nature and the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000.

22. To establish that the scientific research and development, which are performed by academic and VUZ scientific organizations in accordance with contracts with ministries, departments, associations, enterprises, and organizations, are financed by means of the assets of the clients.

To extend to academic and VUZ scientific organizations the basic principles and conditions of the fulfillment of contractual operations, which are established by this decree.

23. The USSR Academy of Sciences, the USSR State Committee for Science and Technology, and the USSR Ministry of Higher and Secondary Specialized Education are to draw up and submit within a 6-month period the necessary suggestions on the gradual changeover of academic and VUZ scientific organizations to the new methods of financing and management with allowance made for the specific nature of their activity and the provisions which have been set forth in this decree.

VI. The Organization of the Work on the Changeover of Scientific Organizations to the New Conditions of Management

24. USSR ministries and departments and the councils of ministers of the union republics are to accomplish the changeover of scientific organizations to the conditions of work, which are envisaged by this decree, during the period which has been established for the changeover of associations and enterprises of the sectors of the national economy to full cost accounting and self-financing.

25. Ministries and departments when drawing up the master plans of the management of sectors are to ensure the efficient specialization of production and scientific production associations and the unification in them of

all the units of production—from applied research to series production and maintenance. Here to proceed from the fact that scientific research, planning, design, and technological organizations for the most part should be included in associations and only in exceptional cases, if an overwhelming amount of their research and development is intended for the solution of intersectorial or sectorwide problems, can remain outside associations.

26. To abolish starting in 1988 the planning of allocations from the budget for the maintenance of scientific organizations in accordance with the base method and to establish that the budget assets in the estimates of these organizations are stipulated and taken into account separately with respect to each specific theme.

The USSR State Committee for Science and Technology is to carry out the distribution of the allocations for science, which have been earmarked from the budget, among national economic complexes and directions of the development of science and technology, on the basis of the need for the provision with budget financing of the operations on the most important theoretical research, on intersectorial scientific and technical problems, which are of statewide importance, and on the development of fundamentally new equipment and technology, which revolutionize social production. Jointly with the USSR State Planning Committee and the USSR Ministry of Finance to develop and approve the methodology of determining the amounts of allocations, which are earmarked from the budget, for specific themes of scientific research and development.

27. To establish that the remuneration of the labor of the workers of scientific research, design, technological, planning, surveying, and other scientific organizations, which have been changed over to full cost accounting and self-financing, is carried out in conformity with Decree No 462 of the CPSU Central Committee, the USSR Council of Ministers, and the All-Union Central Council of Trade Unions of 22 May 1985, Decree No 1115 of the CPSU Central Committee, the USSR Council of Ministers, and the All-Union Central Council of Trade Unions of 17 September 1986, and Decree No 1231 of the USSR Council of Ministers and the All-Union Central Council of Trade Unions of 17 October 1986.

To commission the USSR State Committee for Labor and Social Problems jointly with the All-Union Central Council of Trade Unions to specify the procedure of the application of the rates and salaries, which are envisaged by the indicated decrees, at these organizations.

To grant the managers of the indicated scientific organizations, which have been changed over to full cost accounting and self-financing, the right to enlist in necessary cases for specific period highly skilled specialists for work as consultants in accordance with the procedure and on the terms, which are envisaged by Subparagraph "b" of Paragraph 2 of Decree No 85 of the USSR Council of Ministers of 20 January 1986.

28. The USSR State Committee for Labor and Social Problems jointly with the USSR State Committee for Science and Technology and the All-Union Central Council of Trade Unions is to revise with allowance made for the requirements of this decree the system of the certification of scientists, having increased its role in the development of an effective mechanism of the evaluation of their labor.

29. The USSR State Committee for Science and Technology jointly with the USSR State Committee for Labor and Social Problems is to continue the work on the improvement of the prevailing forms and the search for new forms of the organization of scientific labor, which are aimed at the increase of the dependence of its remuneration on the results of work.

To regard as the most important factor of the increase of the efficiency of the work of scientific organizations the formation of highly skilled scientific collectives, the extensive enlistment in development of talented scientists and experienced workers, the development of an effective system of the optimum updating of the collective, and the steady increase of the scientific and creative potential, which meets the present requirements. For this purpose to gradually introduce in the practice of the work of scientific organizations a system of the conclusion of contracts between the administration of the scientific organization and groups of scientists or individual specialists for the performance of scientific, technical, and experimental design work.

30. To deem it necessary to increase the responsibility of the USSR State Committee for Science and Technology, the USSR State Committee for Construction Affairs, the USSR State Agroindustrial Committee, ministries, and departments and to tighten up their monitoring of the activity of scientific organizations. Ministries and departments are to make a careful analysis of the activity of subordinate scientific organizations, to specify their type and specialization, to identify inefficient ones, to strengthen them, and, where necessary, to transform or eliminate them in consultation with local organs in conformity with the procedure established by the USSR Law on the State Enterprise (Association). On the basis of the tasks facing the sectors to establish engineering and service centers, introducing organizations, and other mobile and flexible collectives, which ensure the increase of the efficiency of the use of resources and the quality of the product (operations, services).

31. The USSR State Planning Committee, the USSR State Committee for Science and Technology, USSR ministries and departments, and the councils of ministers of the union republics are to make the changes in the

indicators approved in the five-year plan, which follow from the conditions of the changeover of scientific organizations to full cost accounting and self-financing.

32. The USSR State Committee for Statistics and the USSR Ministry of Finance are to make the necessary changes in the accounting and statistical reporting of scientific organizations, which follow from this decree.

33. To commission the USSR State Committee for Science and Technology to perform the necessary organizing and procedural work with ministries and labor collectives of associations, enterprises, and organizations on the implementation of measures which are connected with the fulfillment of this decree. In necessary instances to give ministries and departments explanations on its application.

34. To establish that the economic mechanism of the management of scientific organizations, which is envisaged by this decree, is common to all the sectors of the national economy.

To grant the USSR State Committee for Construction Affairs, the USSR State Agroindustrial Committee, and ministries and departments of the nonproduction sphere in consultation with the USSR State Planning Committee and the USSR State Committee for Science and Technology the right to apply individual provisions of this decree with allowance made for the specific nature of the activity of subordinate scientific organizations.

The CPSU Central Committee and the USSR Council of Ministers express confidence that the scientists and engineering and technical personnel, workers and employees of associations and scientific research, planning, design, and technological organizations will do everything necessary for the successful accomplishment of the posed tasks on the increase of the efficiency of scientific research and development and will ensure the practical restructuring of the work on the acceleration of scientific and technical progress.

[Signed] Secretary of the CPSU Central Committee M. Gorbachev

Chairman of the USSR Council of Ministers N. Ryzhkov

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Stimulation, Financing of Invention

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[Article by A.F. Renkel, engineer-patent expert of the Moscow Institute of the Petrochemical and Gas Industry imeni Gubkin: "Invention and Its Financing"]

[Text] A state approach to invention for the first time in the history of mankind was displayed on the initiative of V.I. Lenin. The idea of organizing a unified state center, which would manage all inventing affairs in the country, belongs to him. Today the USSR State Committee for Inventions and Discoveries carries out the general supervision of the development of invention and rationalization. The protection of state interests in the area of inventions and discoveries, including the protection of USSR patent interests abroad, has been assigned to it. The Soviet patent department issues for a technical solution, which has world novelty, substantial distinctive features, and utility, at the request of the applicant an inventor's certificate or patent. How do these protective certificates differ from each other?

The holder of an inventor's certificate a priori transfers the right to the implementation of his invention to the exclusive right of the state, while the patent holder retains this right and implements the invention by the sale of licenses for 15 years. In requesting an inventor's certificate, the applicant does not incur any financial costs, while for the obtaining of a patent and its keeping in force it is necessary to pay patent duties.

The advantage of the applicant, who requests an inventor's certificate, is obvious. The inventor's certificate is a form of the protection of inventions without a time limit, which is characteristic of socialist society and in which public and personal interests are harmoniously combined. The fact that all Soviet citizens receive inventor's certificates for inventions, expresses the high degree of their consciousness and the willingness to place at the disposal of the state the results of their creative labor.

The state is also none the worse off. After making a free patent appraisal of a declared invention, it grants Soviet enterprises and organizations the right to its use without a license, while obliging the introducing enterprise to pay the inventor a fee (2 percent of the derived economic impact is paid to the author over 5 years from the start of industrial use, but not more than 20,000 rubles) and to pay a bonus to the workers of the enterprise for promoting the introduction of the invention in the amount of 1.5 percent of the sum of the saving, which is derived during the first year of use, or 35 percent of the amount of the reward for the use of an invention which does not create a saving. Is this a lot or a little? Alas, today creative technical work is being stimulated more formally than in essence.

First, the prevailing Statute on Discoveries, Inventions, and Efficiency Proposals (1973) is being poorly fulfilled: in many cases the author's reward is not paid and it is necessary to seek it through the court. The settlement of disputes, which are connected with the application of invention law, presents great difficulty for the court, since it requires special knowledge in the field of engineering, patent affairs, and economics. And in legal norms there are no indications of the specific sanctions for the violation of plan assignments on the introduction of individual inventions and the ones included in the plan on new equipment, for the concealment of their use, and for delay with the payment of the reward. But the

harm, which a bureaucrat does in case of the delay of the implementation of just one major invention, comes on the average to 52,000 rubles a year.

Second, the statute itself has not kept up with life. Thus, the maximum reward (taking into account the appreciable increase of the average wage) is very modest by present notions. While the managers of enterprises, on whom the use of a new invention depends first of all, do not have the right to receive even a meager bonus for promoting the introduction of a new technical solution. It seems that this is a substantial economic blunder. We want to obtain a large economic impact from an invention, but are placing financial and time limits in its way.

Indeed, in 5 years a significant invention usually does not reach the stage of mass assimilation by industry, and the basic saving is derived after the 5 "payment" years. Therefore, the author, on the one hand, is interested in the development of a minor, quickly introduced invention and in the dragging out of the period of the introduction of a major invention, which has been developed by him, for the organization of its large-scale use. On the other hand, he is not interested in giving assistance to production in the use of his own developments after the expiration of the paid period of the introduction of the invention.

Such a saving on the reward to authors of inventions does significant harm to the state economy. The compilers of the statute also managed to "cut" this 5-year period by half a year. If the introduction of an invention began, let us assume, on 30 June, it is considered used as of 1 January of this year. The simplicity of keeping accounts in this case is achieved at the expense of the interests of the inventor. It is so advantageous and convenient, but for whom? The state and inventors? Of course, not. This "procedure" needs change. It is necessary to reckon the start of the use of an invention either from the day of its introduction or from 1 January of the following year.

The fact that prevailing legislation grants equal conditions of protection to both major and minor inventions leads to the devaluation of the importance of high results of creative labor. Here it turns out that the state and the inventor, who receive the inventor's certificate, are the losers from the shortened time lag. He gave his work to the state, but turned out to be under worse conditions than the foreign patent holder, who sells on the territory of the USSR licenses for his invention for 15 years.

However, not only the author of the invention and the manager of the enterprise, but also the collective of the enterprise as a whole are not interested materially in the use of the invention, since the statute does not envisage the possibility of the transfer after the payment of the reward (2 percent) and the bonus for the promotion of introduction (1.5 percent) of the remaining (96.5 percent) economic impact to the fund for sociocultural measures and housing construction of the enterprise.

The maximum amount of the reward for an invention (20,000 rubles) is fourfold greater than for an efficiency proposal. Such a ratio seems correct, taking into account the difference of the levels of novelty and social significance of technical solutions. But the introduction of an invention, as is known, is also a lengthy, more difficult, and more complex process vis-a-vis it. However, they are rewarded with the same 1.5-percent bonus for promotion, not to one iota of which the author, who promoted the introduction of his own proposal, has a right. Of course, this is another stumbling block in the way of the introduction of inventions.

Statistics confirm that every 10 minutes an invention originates in our country, but far from all of them are implemented. In 1986, 24,000 of them and more than 4 million efficiency proposals were used. In the opinion of patent experts, such a quantitative disharmony of technical solutions ensues from the well-known axiom: "Any invention can also be declared as an efficiency proposal." On this basis several specialists have begun to officially register published inventions as their own efficiency proposals. Given the equal bonus for the promotion of the introduction of technical solutions such a plagiaristic phenomenon is prospering successfully. If the fact of the introduction of such an efficiency proposal-invention becomes known to the actual author, they also pay him the reward without unnecessary delays from the state pocket.

The veiled introduction of inventions interferes with accounting, reliable and extensive information on it, and, of course, its duplication; it enables the managers of enterprises not to pay the reward to the actual authors and to conceal the technical lag of production by the retention of the former norms and rates. I believe that this negative phenomenon in our patent law can be eliminated by the increase by two- to fourfold of the bonus for the promotion of the introduction of inventions as compared with the bonus for the promotion of the introduction of efficiency proposals, as well as by the elimination of the ban on this bonus for the author of the invention. Incidentally, in Hungary they conclude a labor agreement with the author and with other people, who undertake to promote the use of an invention, if such activity is not included within the framework of their official duties. In Poland bonuses in the total amount of up to 200 percent of the reward, which is due the author, are paid to people who participate in the dissemination and implementation of an invention at other organizations.

A material incentive for the authors of inventions, which are patented abroad, is also very poorly envisaged by the statute. The legal protection of Soviet inventions abroad is guaranteed by their patenting in the countries of the proposed export of the product or the sale of a license. If a Soviet invention is patented, the corresponding export product acquires great value. Soviet foreign trade organizations can deliver it on a monopoly basis and derive

a profit. The purchase abroad of a license for an invention is well-founded only when it can promote in the shortest time the substantial increase of the level of equipment in one area or another of physical production. Finally, the license for an invention besides the necessary technical information gives the purchasing firm (the licensee) the sole right to the production and marketing of the item. If analog-patents (patents which protect in a number of countries the same invention) are not obtained for a Soviet invention, foreign firms can use it free of charge.

The patenting of inventions abroad is an expensive action, but it is of great importance both for the Soviet Union and for its foreign trade partners. The technology of these trade transactions is such that, in selling a license, the selling firm (the licensor) acquires the opportunity to obtain significant currency receipts without the exporting to foreign markets of finished items and at times without substantial expenditures. Thus, Japan by 1990 plans primarily to export not items and machines, but new scientific and technical information on patented inventions and know-how (the transfer for a fee of production secrets and the technical know-how of enterprises). Data banks, which are accessible to computers, will be the repository of this new type of commodity.

During the age of the scientific and technical revolution not one even most powerful industrial power is capable of guaranteeing itself a leading position in all fields of knowledge and technology. Intensive technological exchange has become an everyday practice. In the past few years the countries of the West have purchased from the USSR and other socialist countries licenses worth $50 million. American firms during 1973-1983 purchased from the countries of Eastern Europe more than 125 licenses, including for a contact lens, a heart attack remedy—etnozin, a method of the electromagnetic casting of aluminum and copper, the production technology of a surgical sewing machine, and so forth.

For the purpose of expanding license trade in Soviet inventions the statute established specific steps of the material stimulation of organizations, authors of inventions, and workers, who actively promoted the sale of licenses. The reward to the authors for an invention in case of its realization by the sale of licenses abroad is paid by the USSR State Committee for Inventions and Discoveries in the amount of up to 3 percent of the sum, which was derived from the sale of licenses. Here the reward, which is credited to the authors for the use of an invention in the USSR national economy and for its realization by the sale of a license abroad, is added up and cannot exceed the established maximum of 20,000 rubles. It seems that such a procedure of stimulation decreases the interest of the authors of the most effective inventions when settling questions which are connected with foreign patenting. They will also receive the maximum reward in case of the introduction of the invention only on the territory of the USSR. And again due to the fear of the compilers of the statute "to load with money" domestic inventors the state is losing currency. Incidentally, in the GDR the maximum reward for an invention (200,000 marks) is nearly threefold greater than in the USSR.

The 3-percent reward to authors for an invention in case of its realization by the sale of a license abroad should be regarded, in our opinion, as guaranteed and additional stimulation of the performed work. For example, in Bulgaria the authors are granted the right to receive 3 percent in currency. Of course, Soviet inventors should also be confident that their initiative and assistance in case of the foreign patenting of inventions will be properly appraised. It is also necessary to lengthen by two- to threefold the "payment period."

The rapid progress of invention in our country has one negative consequence—the legal norms pertaining to this area are rapidly becoming obsolete. The USSR State Committee for Inventions and Discoveries for several years now has been working on a draft of a new USSR Law on Invention, by which the interests of the state and the rights of innovators should be reliably protected, and "the conditions of most favorable treatment" for enterprises, which realize inventions, should also be reflected for the good of all of us. The need for it became urgent long ago. The law should be equal to its purpose, for the quality of a law is the main condition of its effectiveness. Under present conditions it is especially important to see to it that the law, in the words of V.I. Lenin, would not resound with "a sweeping nature, abstractness, and impracticality."[1] With its adoption all the difficulties, which today are hindering the more rapid and larger scale realization of innovations, including ones which are capable of becoming perceptible milestones in the scientific and technical progress of various sectors of the national economy, should disappear.

The use of inventions lags behind the pace of their development. In the State Committee for Science and Technology they have calculated that 80 percent of the new developments are used at only one enterprise, less than 20 percent are used at three or four, and only 0.6 percent are used at five and more. It is necessary to correct the financial aspect of the process of assimilating inventions with allowance made for historical experience in this matter. Economic stimulation is as if the final element of the system of management, including the management of scientific and technical progress. It is necessary to apply it skillfully, on a scientific basis, with the use of all legal, material, and moral means. It seems that it would be correct to leave to the enterprise, which was the first to introduce the invention, the entire amount of the economic impact, which was derived during the first 3-5 years of assimilation of the invention (of course, less the author's fee and the bonus for the promotion of the introduction of the invention). Then enterprises will themselves "pursue" inventions and their developers, and not "shun" them.

Under present conditions the development of initiative and enterprise is a command of the times. Labor collectives must be placed under such conditions, so that they simply could not do without the fruits of scientific and technical progress. The economic impact, which is derived by enterprises from the introduction of an invention, will be distributed in a differentiated manner. The enterprises, which have arrived second at the "inventor's desk," but during the 1st year of introduction of the invention, can leave in their current account, say, 70 percent of the economic impact from the use of the invention, during the 2d year—50 percent, during the 3d year—30 percent, while in subsequent years—only 20 percent. The remainder is transferred to the state budget. As businessmen say, look alive Foma, there is also a trade fair for that. Yes, precisely a trade fair of inventions! For it is clear to everyone that if the collective of the trailblazing enterprise is not afforded an opportunity to use at its own discretion the economic impact from the use of an invention, they are thereby also discouraging others from assimilating it. It is more profitable to encourage, aid, and assist in every possible way both the first and the numerous subsequent introducing enterprises. Cost accounting, a flexible system of incentives and restrictions—that is the means of developing socialist enterprise. V.I. Lenin attached particular importance to the material stimulation of creative technical work and to incentives for the improvement of production. "Without personal interest nothing will come of it," V.I. Lenin said. "It is necessary to know how to create an interest."[2]

In the Policy Report of the CPSU Central Committee to the 27th party congress it is stressed: the considerate, respectful attitude toward the experience of each other is an enormous reserve of the socialist world.[3] The requirement is most topical. The efficient organization of the economic stimulation of progress in science and technology is one of the conditions of the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000. A search for new forms of management is under way in the fraternal countries. Abundant experience, which merits attention, has been gained there. In the GDR, for example, combines, to which along with production subdivisions scientific and technical subdivisions, as well as special structural units, which ensure the rapid application of inventions in the national economy, belong, are successfully operating. In all 50 percent of the saving, which arises as a result of the introduction of an innovation, is left at the disposal of the combine and ends up in the material stimulation fund and the fund for social needs.

The financial fund of the Bulgarian Progress Firm, which introduces domestic and foreign inventions, is formed from a portion of the economic impact from the introduction of an innovation—up to 30 percent of the largest amount of the profit, which has been derived during any of the last 3 years.

For the large-scale "breakthrough" of inventions into industry they need a master "with money." In socialist society this is the bank, which has its own departments in all corners of the country. The bank can create the necessary conditions for many inventors, who are willing in 1-3 years to bring their developments up to extensive assimilation by industry, and can grant credit to enterprises for the introduction of scientific and technical innovations.

In the CSSR agreements on credits for 3 years at a rate of 3 percent are concluded between the bank and enterprises. Enterprises replenish the technical development fund by means of the profit, which is derived from the introduction of advanced equipment and technology. With these assets it is possible to purchase licenses and the necessary equipment. The Bulgarian National Bank is successfully using flexible forms of credit for the purpose of stimulating scientific and technical progress. Its share in the spending of enterprises, which is connected with the modernization of products and the introduction of the latest technologies, has been increased. The interest paid in this case is significantly less than the usual interest. At times it is not collected at all. The Innovation Fund, which is an independent cost accounting organization, which enables specialists to make an experimental check of technical innovations and to conclude the corresponding contracts with interested organizations, has been established in Hungary; it finances inventions prior to the sale of the finished product.

The financing of the development of equipment should be of an "active nature" and purposefully influence the shortening of the time of the introduction of new equipment in social production. As for the All-Union Bank for the Financing of Capital Investments, our financiers are not agreeing to any extraordinary steps, which stimulate scientific and technical progress. Four years after the issuing of the 1974 Statute the All-Union Bank for the Financing of Capital Investments promulgated Explanation No 135 on the Procedure of the Submitting of an Application for an Efficiency Proposal Which Applies to Capital Construction. The State Committee for Inventions and Discoveries approved it, while the Central Council of the All-Union Society of Inventors and Efficiency Experts duplicated and distributed it among all organizations and enterprises of the country. For what is this circular noteworthy? For its Paragraph 4, which states: "In case of the identification of cases of an invalid demand for sums for payment the rewards to the author of an efficiency proposal are to be issued...only after...the confirmation of the superior organization." Well, it turns out that financiers suspect a priori in every production innovator a dishonest person, while executives of the State Committee for Inventions and Discoveries and the All-Union Society of Inventors and Efficiency Experts do not see this. But then efficiency experts and workers of the bureaus for efficiency promotion and invention feel very uncomfortable under the distrustful

glance of the financier. It turns out that, taking Explanation No 135 as a guide, the financier requires confirmation of the honesty and decency of the efficiency expert on the part of the executives of the superior enterprise. The latter submits for approval an economic impact only of more than 50,000 rubles. If the efficiency proposal did not make it to this amount, the efficiency expert can give up the reward (if the superior enterprise does not submit it for approval, the bank does not pay it), efficiency promotion, and the rapid development of scientific and technical progress.

The history of invention testifies that only the cost accounting laboratory can be the transmitter of a major invention to industry. Thus it was during the times of Edison, thus this should also be organized today in our country under the aegis of the bank. Of course, a risk exists in the favorable outcome of such a measure, and the bank will require guarantees against the extension of credit and a specific commission for its assistance. The USSR Academy of Sciences and the State Committee for Science and Technology, to which the organization of temporary (for a term of up to 3 years) intersectorial laboratories was assigned by the decree of the USSR Council of Ministers of 23 January 1984, can be the guarantors. As for the commission, the allocation of several percent of the 96.5 percent in favor of the same Promstroybank for the conducting of operations and the stimulation of financial personnel will not be at a loss, since the drastic shortening of the time of the industrial assimilation of highly efficient inventions is in state interests!

Such a system, in our opinion, will make it possible to concentrate all work in the hands of a specialized division of the bank (both patent experts and engineers can be recruited for this division); will free inventors from the gathering of information on the extent of use of an invention and the derived saving; will create the necessary automatism in the payment of the reward and in the information support of the invention. The need for the institution of an all-union centralized system of the payment of the reward for used inventions will disappear. It will be possible to abolish the Administration for the Protection of the Rights of Inventors and the Centralized Payment of the Reward, which now operates on the territory of three regions of the country, by means of deductions from the 2-percent fee of the authors of inventions. The principle of the protection of the rights of inventions has been elevated to the rank of a constitutional norm, and the existence of the administration at the expense of inventors seems simply absurd.

It is clear that the incentive reward to financial workers should be paid after the receipt by the inventor of his 2-percent fee. In this way another "bird" would be "killed": the timely payment of the author's reward to inventors would become an immediate concern for financial workers, who now will be interested and very persistent!

Given this system it will also be possible to do away with another "bird" in the field of invention—with false joint authorship. The need of inventors to seek influential people, who promise them for joint authorship their own go-getting administrative potentials and supply talent, will disappear.

In 1748 on the initiative of M.V. Lomonosov the first scientific research laboratory in Russia, in which the great scientist conducted his research in the field of physics and chemistry, was built. Undoubtedly, today the inventor himself should also be the initiator of the establishment of a creative laboratory: who knows better than him the level of a development and the possibilities of an invention! The sound application of an inventor for the establishment of a creative laboratory for the confirmation of competitive ability will have to pass for 1-2 months through the filter of the sectorial department of the State Committee for Inventions and Discoveries, and then should be studied, adjusted, and taken under their wing by founder-coordinators of the USSR Academy of Sciences or the State Committee for Science and Technology, which would send it to a specialized division of the bank. Financiers (not the State Committee for Inventions and Discoveries!) should recommend the introduction of the invention to the sectorial ministry or enterprise, which has been requested by the inventor. The interested parties determine the location of the laboratory and its production potential, coordinate the time of the development, production, and pilot operation of the materialized invention, conclude contract-obligations, and open credit for the maintenance and cost accounting activity of the laboratory and for the purchase, production, and installation of equipment. Now the inventor under the control of and with the support of the founders, the bank, and the interested enterprise should demonstrate his professional qualities. And it is possible not to doubt: he will! Inventors can organize both student construction detachments and engineers, who are willing to use their personal time, received education, and knowledge properly. Just give these laboratories limits of the number and the wage fund, as well as the freedom of the combining of jobs.

The author hopes that the opinions and suggestions, which were voiced by him in the article, will make it possible to stimulate an interest of the scientific and technical community of the country at large in the key problems of invention. The open and national discussion of these problems will make it possible to work out quickly the optimum versions of their solution.

Footnotes

1. V.I. Lenin, "Poln. sobr. soch." [Complete Works], Vol 40, p 82.

2. V.I. Lenin, "Poln. sobr. soch.," Vol 53, p 269.

3. See "Materialy XXVII syezda KPSS" [Materials of the 27th CPSU Congress], Moscow, Politizdat, 1986, p 72.

7807

Ramifications of Introduction of Cost Accounting into Science

18140251 Moscow ARGUMENTY I FAKTY in Russian 27 Feb-4 Mar 88 pp 2-3

[Interview of Boris Leontyevich Tolstykh, chairman of the USSR State Committee for Science and Technology by correspondent of ARGUMENTY I FAKTY: "Science and Cost Accounting;" first paragraph is source introduction]

[Text] B. Tolstykh, chairman of the USSR State Committee for Science and Technology, responds to the questions of a correspondent of ARGUMENTY I FAKTY.

[Question] Boris Leontyevich, readers often complain about the inaction of a number of scientific-research institutes and raise the question of liquidating them. Is this practically possible?

[Answer] We analyze once every two-three years the work of scientific institutions in each sector. In addition, the ministries and departments themselves monitor the work of their scientific-research institutes. But what is the effect of such monitoring if, for example, we find in observing one institute—the All-Union Scientific-Research and Planning-Design Institute for Complete Production Lines of the USSR Ministry of Chemical and Petroleum Machine Building—that according to reports developments for 57 themes were introduced, but in reality the figure was only 7. Are the rest only false indicators? There were 176 supervisors for 71 personnel. Or GiproNIImash [State Scientific-Research and Planning-Design Institute for Machine Building (?)] of the USSR Machine Tool and Tool Building Industry—of a thousand persons only 10 had a degree, and themes were repeated from year to year. In 9 years the institute's staff personnel produced a total of two author's certificates.

On the suggestion of our committee, the USSR Council of Ministers closed down these institutions.

[Question] And what happened to their staff members?

[Answer] They found jobs according to their specialities in other organizations and in production. But I want to say that we will not be able to cure the lingering disease of sectoral science—its weak payback—by means of such an administrative command method. "To close down," "to forbid" or "to abolish" is not difficult. It is more difficult to teach how to work with high efficiency. And this is the most radical route—conversion to economic methods of management. With the introduction of the new conditions of management, results of the work of cost-accounting scientific organizations are becoming a commodity which, depending on quality and assortment, is or is not in demand.

[Question] The question is as I understand it of converting science to cost accounting?

[Answer] Precisely. An enterprise or plant acts here in the role of a purchaser. If it needs new technology or special equipment, it directly concludes a contract with a scientific-research institute. But to the extent enterprises are self-supporting, then, believe me, the sums of money for research work and requirements for fixed times and quality of developments will be maximally strict.

Under such conditions, the maintenance of an idle staff becomes practically impossible, as was the case sometimes formerly when money for science was allocated from above in a centralized manner.

[Question] Boris Leontyevich, a scientific-research institute will now pay both for capital and for manpower resources. But this will increase the cost of research and under the new conditions these deductions will especially aggravate the financial problems of the institutes.

[Answer] At first there were such misgivings, but practice has shown that it is not at all like that. For example, at one machine-building scientific-research institute, they were getting ready to purchase six computer complexes, but after adding up the cost of the capital, they not only rejected it but even decided to sell an already existing unit.

[Question] But is this not to the detriment of research?

[Answer] They simply installed order in operation of the existing complexes and set up three-shift work for them.

[Question] After all, scientific research frequently requires very expensive special-purpose instruments....

[Answer] Let science convince the manufacturer that such an instrument is needed and that it will help production to make this item competitive. And after effective utilization of this instrument, it will be sold. Any intelligent director of a plant will not object. Incidentally, a great number of machine tools of earlier developments have accumulated in the yards of machine-building scientific-research institutes. All this rubbish has been lying there for years. Now it is quickly put in order and sold. Dead capital is resurrected. There is also another possibility—to create centers of joint use for the most expensive instruments.

[Question] Very likely, pay for manpower resources will involve incentives to a more thrifty attitude?

[Answer] First, acceptance of people will be curtailed—this is also an answer to the first question of your readers. Second, acceptance will proceed more carefly, in a differentiated manner, with the use of reliable tests. The future staff worker will have to provide a significant return.

[Question] By the way, what is the present effectiveness of our science?

[Answer] It varies greatly depending on regions and sectors. For example, VUZ science produces a 1.7 ruble return for every invested ruble, the figure for young science in Siberia is 2.5 rubles. The transfer of science to cost accounting, to direct relations with production will undoubtedly sharply boost its return.

[Question] But if scientific-research institutes and enterprises will start to operate on direct contracts and if a self-regulatory system emerges, what then will be the role of the Committee for Science and Technology?

[Answer] This year more than 1,200 institutes will convert to cost accounting—this is a big share, but not all. Furthermore, in those collectives which have gone over to cost accounting, the portfolio of orders will be formed on the basis of direct contracts, in some cases amounting to 80 percent, and the rest on the basis of state orders.

This means that as before we will continue to have problems of determining priority of research, proper allocation of monetary resources of state orders and timely orientation of scientific collectives toward major themes with a quick economic effect.

It should be said that in distinction to industry, science has not undergone corresponding experimentation and testing in regard to conversion to the new conditions, consequently we are learning as we go along. In China, where this problem started to be resolved earlier, they consider possible full conversion of science to cost accounting in the course of the next 3 years.

We have maximally reduced the committee's apparatus, but nonetheless are setting ourselves the task to continuously develop new forms and to improve the economic mechanism. Moreover, we need to relate to and coordinate our own problems and successes of Soviet science with the development of world science, but the main thing is that we now have behind us the development of the Comprehensive Program of USSR Scientific and Technical Progress for 20 Years.

[Question] But what are the first practical steps of the transition of science to the new economics? Will not scientific-research institutes be no better off than before?

[Answer] Scientific collectives of the machine-building complex, for example, have filled the portfolios of their orders with two-thirds consisting of direct orders and one-third of state orders. We believe that with time, state orders will not be more than 20 percent.

I can say in general, that a strong and sound science does not look for a customer, he himself comes to look for it.

[Question] Take a kolkhoz or sovkhoz—it is not in a position to order the development of a combine or tractor suitable for local conditions. A centralized order, perhaps? We know what this has resulted in—tens of years of marking time, piles of metal on fields or in ravines.

And a "customer" will hardly be found for archeological excavations or, let us say, for a theory of the origin of the world....

[Answer] Today at academic institutes, direct contracts make up about 15 percent. We think that their volume under the new conditions will double, but all the same basic research will be financed centrally. Such is its specific character.

But the interests of a kolkhoz must be upheld by regional agroindustrial committees. Specific combines are needed for the whole region, and an order can be put out by pooling money together.

[Question] Boris Leontyevich, there is a long-standing question which is painful to refer to but it is one which concerns many readers. We will be dealing with the travails of inventors. Because of the struggle for the "honor of the uniform," valuable inventions will be lost in the depths of various scientific-research institutes, and it is hard for one to conceive the losses....

[Answer] Right now the "Law on Inventions" is being discussed with representatives of the broadest public. The new legislation is closer to international rules and provides more benefits and rights to inventors, while the procedure of protecting the rights of inventors in the courts is being improved.

But the main significant consideration is that economic levers for management of science will now oblige scientific-research institutes to look for such inventors with their valuable ideas and ready developments. After all, the better an invention is, the more quickly and effectively will it be introduced and the more money will remain with the collective of the scientific research institute for salaries, development and social-cultural and personal services.

[Question] For the time being, inventors realize their ideas through cooperatives and other public organizations.

[Answer] Although we have to guide scientific and technical progress as a whole, globally, we still provide the broadest possible support to the few cooperatives, centers of scientific and technical creativity for youth (NTTM) and temporary scientific and technical collectives. We are entirely for the development of introductory, production and engineering cooperatives. The Kiev Polimermash Cooperative is an example. Not everyone actually believes in the results they have achieved.

At the USSR State Committee for Science and Technology, a special group has been created which works on the elimination of all hindrances on the path of development of public technical organizations of various kinds.

[Question] It is gratifying that conditions are being created for youth for working in centers of scientific and technical creativity. But how the introduction of young people proceeding at scientific organizations?

[Answer] Youth is characterized by daring and dynamism. Consequently the influx of young people into science inevitably will result in a qualitative jump in its development.

At academic institutes, an age limitation has now been introduced (65 years) for filling supervisory positions for all with the exception of academicians and corresponding members. And the latter can administer only to 70 years of age. After that they can devote themselves solely to science or training of personnel.

[Question] But is there a systematic search for talented young people and their advancement to leaders of science?

[Answer] Interesting work in this direction is being done by the Moscow Physico-Technical Institute: it organized trips of selection commissions to Vladivostok, Khabarovsk, Chelyabinsk, Krasnoyarsk and Kiev where about 100 students selected.

Novosibirsk University conducts selection of gifted youth through specialized schools.

Incidentally, one of its graduates, Yu.L. Yershov, defended his candidate's dissertation one year after graduation and his doctoral after two. He is now a corresponding member of the USSR Academy of Sciences and rector of this university. Together with Doctor of Physico-Mathematical Sciences Kotov, he developed an original computer with an extraordinary high speed of operation. Here you have an example of a young leader in science.

[Question] Boris Leontyevich, readers are interested—is it true that the pay of a doctor of sciences is greater than the pay of a minister?

[Answer] The question is not quite right, especially since it is not so rare for a doctor of sciences to be a minister.

The fact is that only the position or the amount of work is remunerated rather than the degree itself which provides the possibility of aspiring to the position.

If a doctor of sciences heads a department or institute of the highest category, his salary can be as much as 600-700 rubles a month. This, of course, is more than the salary of a republic minister. But for the position of senior scientific associate the minimum salary is 250 rubles.

[Question] Incidentally, readers ask—why do scientific-research institutes of the first, second and third category exist? Is there actually a science of a first or third category?

[Answer] At the present time, there are practically no third-category institutes. But varying scope and depth of research, the presence of experimental production and much introductory work or the absence of such determines the difference in level of pay, benefits and advantages. Priority and effective work will always be better paid. Economics itself requires that.

Actually, the whole intent of the reform we are carrying out is to provide a way for everything that is new and progressive.

7697

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Production Quality Control at Kvant Scientific Production Association

18140132 Moscow VESTNIK MASHINOSTROYENIYA in Russian No 10, Oct 87 pp 69-71

[Article by Candidate of Technical Sciences V.M. Mishin and Candidate of Technical Sciences A.G. Zekunov: "The Information Support of Production Quality Control at the Scientific Production Association"]

[Text] The development of the research-production-product use cycle is characterized by a significant increase of the volume and the broadening of the structure of information flows.

The Kvant Scientific Production Association is one of the main ones in the country for the production of a wide range of current sources for various purpose. Under the conditions of the functioning of such a scientific production association, which is characterized by the complexity of the organizational structure, the diverse nature of production, and a large range of products that are being developed and produced, the effective solution of the problems of increasing the technical level and quality of a product in many respects depends on the system of the information support of quality control. In this connection the provision of researchers, developers, producers, as well as consumers of a product with the necessary information on the most important technical, economic, organizational, and other achievements in the area of the increase of its technical level and quality is acquiring great importance. The special subsystem "The Information Support of Product Quality Control," which operates within the comprehensive system of product quality control (KS UKP) of the scientific production association, is aimed at this.

The increase of the efficiency of the information support of the process of controlling the technical level and quality of a product depends on a large number of factors, which are due, on the one hand, to the acceleration of the development of science and technology and, on the other, to the inertia of information, as a result of which the consumer receives the necessary information with a delay. Moreover, the traditional forms of information processing and retrieval cannot provide the consumer with reliable and complete data under the conditions of the increase of the information flows. Therefore, the achievement of high technical and economic indicators of a product that is being developed and produced is impossible without the improvement of the system of information as a whole and the system of information retrieval and the use of new types of sources of information and methods of its analysis.

The system of information supply at the scientific production association is based on a set of standardized indicators of the quality of a product and labor and their classification. Unified forms of documents, which record these indicators, have been developed.

All the information, which is used during product quality control at the scientific production association, is classified according to the following types:

—indicators of the quality of a product and labor;

—internal information (failures during product tests, rejects during production, production losses, and so forth);

—external information (comments on operation, the existence of complaints, and so forth).

The composition and content of the information support of quality control are determined by the range of products of the enterprises of the scientific production association and their properties, by the organizational structure of the association, and by the functions of the system of quality control. Product quality control should be carried out at all stages of the life cycle of items and at all levels of production management. In this connection it should be noted that the processes of quality control have been inadequately automated both at the stage of research and designing (especially in case of the forecasting of the needs of the technical level and the planning of the increase of quality) and at the stage of use.

Information supply also has a number of shortcomings, which are characteristic not only of the scientific production association in question, but also of enterprises of other sectors of industry. Thus, for example, there is no complete scientific, technical, and economic information on the technical level of a product, on the best foreign analogs, and on the expenditures on question, and at the same time unnecessary information, which is not used by developers when designing a new product, is being received; information supply is not always adequately regulated by standard technical documents (NTD's), particularly the standards of enterprises (STP's); the systems of the gathering and processing of information on quality do not meet the present requirements, for the most part only individual special tasks of the recording of the quality of labor, losses from defective output, and complaints are automated.

The analysis of the information on quality, which was made in accordance with the data of the statistical reporting of the technical control division of the scientific production association, made it possible to identify a number of means of improving the information support of product quality control, the basic ones of which are:

—the development and use in production of a common classifier of the possible causes of defective output;

—the unification and improvement of the prevailing reporting and accounting documentation on quality, which is in circulation at the association;

—the use of the method of Pareto diagrams in the technical and economic analysis of product quality;

—the typification of the forms of reporting on quality and reliability at the association;

—the introduction of an automated system of the gathering and processing of information on reliability (ASIN) in the practice of the work of the scientific production association.

The use of a common classifier for the scientific production association of the possible causes of defective output makes it possible to systematize and classify the defects that are encountered during the output of a product and to carry out the processing of all the information on quality with the use of a computer. The availability of such a classifier affords the opportunity to solve many problems, which are connected with the evaluation of the quality of a product and labor, and makes it possible to determine more objectively and efficiently the values of the generalized indicators of the quality and the levels of quality of a product in accordance with the methods which are regulated by the standard technical documents. The great possibilities of the classifier appear when determining the significance of defects, which is necessary for the inspection check of the degree of quality of the work of the staff of the technical control division and the quality of raw materials and materials, which are delivered by supply plants, for the obtaining of rapid information on production defects with the use of computers, for the establishment of the significance of failures and malfunctions of items, for the meeting of claims of the consumer, and for the recording of complaints. A model of such a classifier is presented in a table.

The table includes the case of defective output, perpetrators of defective output and their codes, the performer, the foreman, administration of the shop, division of the chief designer, division of the chief process engineer, the technical control division, the supply division, discrepancy in design documentation, discrepancy in technological documentation, negligence in work, violation of technological documentation, malfunction of tools, attachments, and accessories, malfunction of equipment, damage of items during transportation, lack of conformity of materials and purchased items to technological documentation, concealed defects of raw materials, materials, and others, lack of conformity to specifications and standards, lack of conformity to drawings, disturbance of technological process, lack of conformity of appearance to standard (specimen), inattention of inspectors, lack of conformity to characteristics during approval tests, marking failed, and other types of defective output.

The use of the classifier also makes it possible to obtain regularly information on product quality, to improve internal production accounting and reporting on quality, and to make a technical and economic analysis of quality. The use of the classifier by the services of the technical control division makes it possible to increase the objectivity of the statistical reporting on quality.

Reassuring practical results were obtained during the processing of statistical information on quality with the use of the method of Pareto diagrams. By means of this method it is possible with respect to all the classified types of defective output to estimate objectively and completely the losses of enterprises and the scientific production association as a whole and to identify the degree of influence of some factors or others on the indicators of product quality. The types of defective output (about 50-60 percent), which entail material losses which in total amount to nearly 80 percent of all the losses in production, were identified by means of this method.

The method of Pareto diagrams is an effective means of developing control actions for the purposes of the assurance of the level of quality of a product being developed and produced, the prevention and warning of defective output at a works, and the increase of the objectivity of the evaluation of the quality of a product and labor. Along with this the diagrams in question make it possible to show objectively the actual state of production in individual sections and to settle an entire set of questions which are connected with quality, including to determine: the number of cases of defective output; the expenditures of time and physical assets on the elimination of defective output; the content of the complaints being received; the number of cases of damage to items in the process of their transportation; the expenditures on the satisfaction of complaints, and so on.

Moreover, the diagrams make it possible to find the sums for individual items of the production estimate and the expenditures on production (raw materials and materials, auxiliary materials, labor expenditures, and others).

The processing of the statistical information on product quality for 1985 in accordance with the data of the technical control division of one of the plants of the association by means of the method of Pareto diagrams (Table 1) showed that 70 percent of the defective output in production is a consequence of the poor quality development of the design and technological documentation.

Figure 1 shows a Pareto diagram and cumulative curve by types of defective output (N is the number of cases of defective output; K is the cumulative percent; the figures on the X axis are the code of defective output in accordance with the classified, see Table 1).

The unification of the presentation of technical and economic information on quality on unified forms, which include indicators: for the characterization of the quality of a product and labor at the enterprise; for the technical and economic analysis of the state of product quality; for the technical and economic analysis of the complaints against items; for the evaluation of the change of product quality, is of great importance in the increase of the objectivity of the evaluation of the quality of a product and labor and the possibility of its comparability with respect to the enterprises of the scientific production association.

The information with respect to the enterprises is accumulated, generalized, systematized, and analyzed by the services of the technical control division jointly with representatives for quality in the subdivisions and economic services of the scientific production association. All the forms of accounting and reporting documentation on quality are common for all the enterprises of the scientific production association. A specialized subdivision of the scientific production association for product quality control in accordance with the results of the technical and economic analysis identifies the dynamics of change of the indicators of product quality at the enterprises for the purpose of formulating measures on the improvement of this indicator.

The establishment of the automated system of the gathering and processing of information on reliability as an element of the plant management automation system of the scientific production association (Figure 2) is an important direction of the work on the automation of the system of the gathering and processing of information on quality. The introduction of the automated system of the gathering and processing of information on reliability in the practice of work of the scientific production association is making it possible to set up efficient and prompt recording to information on the reliability of items, to decrease the labor intensiveness of the processing of information, to issue generalized information on the quality of items of a specific type, as well as to carry out the effective monitoring of the change of the characteristics of quality at various stages of the life cycle of an item.

Figure 2 is a structural diagram of the automated system of the gathering and processing of information on reliability, including input information on quality from enterprises of the scientific production association, subdivisions of the scientific production association for product quality control, record cards of failures (KUO), the card file, computer center, developer departments, performers, input information on quality, enterprises of the scientific production association, and quality and reliability services.

The practical implementation of the methods and means of accumulating, systematizing, generalizing, and processing information on quality, which were presented above, makes it possible to improve the making of the technical and economic analysis of the quality of the product that is produced by the scientific production association, to broaden the group of problems that are solved by means of the comprehensive system of product quality control, and to increase the efficiency of the system of the information support of product quality control. The set of measures on the improvement of the information support of product quality control was included in the comprehensive scientific and technical program on the increase of the quality and reliability of items of the scientific production association for 1986-1990 and the period to 2000.

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7807

Center for New Equipment and Technology Proposed

18140237 Moscow SOVETSKAYA ESTONIA in Russian 23 Mar 88 p 2

[Article by R. Vyrk, deputy chief engineer, TPO "RET" [Not further identified] and R. Denisov, chief, Scientific-Organizational Department, Estonian SSR Academy of Sciences, candidate of physical-mathematical sciences: "Innovations, On the Shelf or at Work—A Republic center for New Equipment and Technology will help in Truely Solving this Dilemna"]

[Text] **"A Point of View"—This is how the authors consider the article published below. We remind the readers that "Effekt" a special design-technological office has been in operation for eight years. Its main function is to introduce technical and technological innovations and the most efficient patents. Although the SKTB [Special Design and Technological Office] is at present subordinate to its creator, the republic Ministry of Local Industry, its activities are of an extra-agency nature. The "Effekt" SKTB can take credit for several successfully introduced developments which have been repeatedly covered in the republic press, including** *Sovetskaya Estoniya.* Cooperative ways of organizing innovators' creative activities are becoming increasingly widespread. The authors of this article propose their way of accelerating the production introduction of innovations.

The introduction of innovations is one of the most difficult questions in scientific and technical progress.

Expert studies (See "Questions About Inventions" No 12, 1987) on 13,000 new items introduced in recent years reveal that only 14 percent of them exceeded world or domestic standards while 77 percent met standards previously attained, that is, they were not progressive. Why are so many of the innovations based upon modifications and improvements made essentially from obsolete technology?

In addition to shortcomings in working out ideas and scientific-research developments (NIR) and the low standards of experimental-design developments (OKR), another reason for this situation is enterprises' reluctance to introduce developments requiring large outlays to preparing production for new products. Obviously, this last is the most important reason for the introduction of large numbers of new items based upon traditional technology. This is also due to many scientific institutions in the country "shelving" up to 50 percent of their developments.

Production risk is another reason for enterprises not wanting to convert to modern production and technology. There might be no benefits, or they might not be very substantial. This could be due to mistaken predictions, shortages of equipment or highly skilled specialists.

Wanting to minimize innovation costs and to avoid production risks, enterprises eagerly utilize proven products.

Thus, there are several problems hindering scientific-technical progress. These include the search for compromises in technological preparations, risk, departmental barriers, some institutions' monopoly power, disinterest, no (incentives). etc. A strategic solution to these problems entails the search for new organizational forms, scientific-technical creativity, its universal support and stimulation—creating conditions making innovation the core idea for all production operations. Introductory firms, or more accurately, systems of introductory firms able to solve these problems should lead this process. They should work closely with VOIR and USSR NIO [Scientific research department] organizations, technical hobby groups, etc.

It is now intended to convert to the regional management of scientific and technical progress. This conversion is fully justified, as each region is a complicated node with massive cultural, economic and other linkages. Regardless of what agencies they are subordinate to, enterprises and organizations in a region are continually exchanging technical information and specialists and signing economic and other agreements.

The effective regional management of scientific and technical progress is possible if there is in the republic an organization of specialists working directly on technical solutions, introductory and mediation functions for enterprises in the republic and therefore capable of making expert scientific and technical assessments and forecasts, making suggestions for improvements and filling primary state orders. This organization should be outside agency barriers, be interested in solving regional problems, not compete with the existing structure (scientific research institutes, special design offices, etc), but, on the contrary, improve its efficiency. Such an organization would directly combine the efforts of the republic government, scientists, innovators and industrial enterprises to accelerate scientific and technical progress.

In our view **these goals could be met by setting up, in the republic, a Center for New Equipment and Technology (TsNTT) as an independent organization on cost accounting** operating on self-support and self-financing principles. In contrast to SKBs, agency institutes and other organizations oriented towards the development and improvement of specific technologies and instruments, the basic goal of the TsNTT would be, as we propose it, to help enterprises in introducing technical innovations, taking into account specific requirements and present production levels.

The center would be guided by the following principles:

Regardless of agency fragmentation, create and develop the basis for contemporary technology in the republic;

Update enterprise products;

Enlist the best specialists into the introduction of technical innovations;

Participate in implementing republic programs.

An important condition for TsNTT activities would be the spread of republic innovations to the USSR and world markets, the extremely large size of which would improve the center's commercial stability.

To complete all or part of specific scientific and technical assignments the center would set up temporary creative collectives of highly qualified specialists at the client enterprises and other enterprises which make up the center's basic work contingent.

To support the activities of the center and its staff it will be necessary to have an information unit constantly entering information into a data bank on scientific-technical developments, on available technical solutions and their readiness for introduction and on specialists wishing to participate in the center's work.

Experimental models should be built with the help of enterprise-clients and other contractors. However, for the center to effectively work on large developments and quickly introduce small ones, it should have substantial facilities (a design office), be able to lease work areas at other enterprises, set up independent affiliates and small

enterprises on cost accounting in other cities in the republic. It would be rational to include the "Effekt" SKTB as part of this center.

Promstroybank should be one of the TsNTT's partners. It could finance start up work, share in the profits and monitor financial activities.

The TsNTT would operate under conditions of increased production risk. It should not fear this. It could finance it through successfully completed work. This would require provisions in the contract for rent, that is, a client would make deductions from profits for a given period, for example, three years. This would make it possible to acquire a material base and bear independent financial responsibility for unsuccessful technical innovations.

In the United States payments for "the risk of innovation" average 30 percent of invested capital. In Bulgaria enterprises make deductions for 5 years, in the first 2 years these amount to up to 30 percent of an item's cost. One-fourth of this is paid to direct participants, sharply improving work quality and reducing introduction time.

As we propose it, the center's work will have great social importance. It will be based upon specialists' initiative and scientific-technical creativity. The center's activities would make it possible to give creative and resourceful people difficult tasks and for them to earn additional money. In our view the TsNTT should be subordinated to the Republic Council of the USSR Scientific and Technical Society.

In essence, this center would be a synthesis of state and artel (cooperative) production organization. The latter would be in the form of autonomous temporary creative collectives, their temporary nature due to the finite time and originality of development and introduction work. They would have to lease equipment. Being a state organ, the center could give already formed collectives orders for specific results and assure the conditions necessary for their fulfillment. The center would become a mediator between client enterprises on the one hand and temporary creative collectives and subcontracting enterprises on the other.

The Center for New Equipment and Technology could be one of the optimal organizational structures for solving major contemporary problems in accelerating scientific and technical progress on a regional level.

11574

New Conditions at Scientific Research Institute of Cable Industry

18140232 Moscow PRAVDA in Russian 8 Feb 88 p 3

[Article by PRAVDA correspondent Yu. Kazmin under the rubric "Radical Reform: Cost Accounting in Science" (Moscow): "By an Unfamiliar Channel"; first paragraph is PRAVDA introduction]

[Text] The news that the collectives of sectorial scientific research institutes are being to work under the conditions of full cost accounting and self-financing, rolled through their departments and soon died down. Wits did not fail to note: they say, it is not the first year we have been married, we have seen everything. Others, who understood that revolutionary restructuring is under way in all spheres of life, including science, rolled up their sleeves and began to rake away the accumulated layers of stagnant times and to install the new mechanism of intensive economic management.

At the All-Union Scientific Research Institute of the Cable Industry G. Svalov, deputy director of the institute for scientific work, became chairman of the commission of the party committee for the changeover to full cost accounting and self-financing. He is an energetic and principled man, a doctor of technical sciences. His opinion is authoritative both among young people and among the older generation of researchers.

More than 40 sectorial and academic scientific research centers operate in Kalininskiy Rayon. The buildings of four large Moscow higher educational institutions are located here. Since 1 January 12 scientific collectives have been working under the conditions of full cost accounting and self-financing. In a year or two the others will join them.

Clearly, given such a powerful scientific potential the rayon party organization kept all this time at the center of attention the progress of the preparation of scientific research institutes for work under the conditions of radical reform. And it relied here on the knowledge and experience of scientists. Thus, together with the collective of the All-Union Scientific Research Institute of Economic Problems of the Development of Science and Technology the rayon committee published for the pioneers of restructuring of sectorial scientific research institutes the small, but substantial pamphlet "Informatsionnyy material po voprosam perekhoda nauchnykh organizatsiy na polnyy khozyaystvennyy raschet i samofinansirovaniye" [Information Material on Questions of the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing]. It was compiled in the form of questions and answers, which give simple and clear explanations on a large number of problems that may arise in collectives when implementing the decree of the CPSU Central Committee and the USSR Council of Ministers "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing."

Moreover, individualized economic education was organized, discussions, lectures, and seminar classes were held at the institute. And all the same, when the time of collective actions and decisions came, so many intricate innuendos and questions arose that G. Meshchanov, first deputy general director of the scientific production association, to which the All-Union Scientific Research Institute of the Cable Industry belongs, wonders:

"When we had prepared for work under the new conditions, superior organizations asked us only one question: Had we concluded contracts for 1988, had financing

been provided? Yes, this is the main thing for the economics of the institute and the scientific production association as a whole. But how many problems, on which the progressive development of sectorial science and its prospects depend, are concealed behind this. Let us take the turnover of the scientific and technical product, the obtaining from it of a profit and settlements with the state budget. The production cycle of the product of the institute comes to 2-3 years, in industry it is significantly shorter—about a month. But as of 1 January they will withdraw in the full amount the 'coin' for all types of resources. It turns out that, not having yet developed its own product, the institute is being deprived of its own assets. This decreases financial stability.

"Would it not be more just for scientific collectives to lengthen the preparatory period to the same 2-3 years, during which we will create the necessary resources for settlement with the state budget? I will note that the institute yields per ruble of expenditures 9 rubles of output. It is also necessary to consider the moral factor. Industry got ready a long time ago for work under the conditions of cost accounting, science did not live by these categories. Centralized financing came to us.... There is one conclusion: in case of the changeover to full cost accounting and self-financing it is important to differentiate the system of the sale of industrial commodity production from scientific commodity production. The USSR State Committee for Science and Technology ordered the Ministry of Finance to see to it that scientific institutions would begin amortization deductions to the State Budget when they derived a real profit and formed their own financial sources. The Ministry of Finance did not see to this."

And here is another problem. According to the calculations of researchers, under the new conditions an appreciable increase of the cost of the scientific product of the institute will occur. Why? Previously they did not make payment to the state budget for manpower resources, fixed capital, and amortization deductions. It is clear that this is a fictitious increase of the cost, inasmuch as somewhere the ends were not made to meet.

Another thing is also paradoxical—in this situation the collectives, which make their quarters in poor premises and do not have a strong laboratory and production base, proved to be in a more advantageous position. As is evident, all the little gears of the new mechanism still have to be put in their places so that it would work for complete turnovers and would prompt scientific collectives to act efficiently, economically, and in a high quality manner, while pursuing the main goal—the rapid accomplishment of the tasks of scientific and technical progress of the sector.

"It is painful and creaky, but all the departments have changed over to the provision of the wage fund on their own," Svalov relates. "The atmosphere, of course, in the process of restructuring became heated repeatedly. Everyone strove to defend his own positions, but we needed to defend the interests of the collective. And first of all those of the cause."

They divided the departments into three groups. The ones having a technical and financial outlet to the external work and those, which on their own are producing a scientific product and are earning money, were included in the first one. The second group united the departments with a functional outlet to the external world—a economic outlet, a patent outlet, and a standardization outlet. The collectives, which are linked only with the subdivisions of the scientific production association or the institute, ended up in the third one: these are the department of scientific and technical information, the department of duplicating equipment, the machine bureau, and so on.

They established a differentiated standard of the formation of the wage fund for all three groups. Moreover, the lowest one was established for those which have an outlet to the external world. Why? Into order to ensure the maximum return per ruble of the wage. Here between each group its own cost accounting with respect to internal supply orders was put into effect. The amounts of work and the price are specified in them. So that the departments would not make involved double counting between themselves, the client loses henceforth the sum, in the amount of which the related industry is obliged to perform work for it.

"Internal cost accounting has firmly tightened up labor discipline at the institute," Svalov says. "And economic discipline. It helped to establish the necessary reserves for the remuneration of the groups, which cannot earn us anything on the outside. For example, artists, sanitary engineers. Now we are completing the second stage of the changeover to full cost accounting, when our every step will be calculated to the kopeck.

"At the institute during this year the psychological climate has changed appreciably. Whereas previously economic affairs worried only the administration, now all are making a calculation of their revenues and expenditures.

"It was necessary to change much and to coordinate much already in practical work. The collective of the experimental high voltage building, for example, has the most expensive equipment and should pay 1.6 million rubles in amortization expenses. But for it the value of the entire amount of work is equal to 800,000 rubles. A portion of its debts had to be turned over to other departments. Those, who have taken these expenses upon themselves, will later derive an additional profit. For this we are forming a reserve fund from the profit. The additional profit of scientific departments was divided into two parts: they retained 80 percent, while 20 percent is being paid into the insurance fund of the institute. In accordance with a decision of the council of

the labor collective from these 20 percent it is also permissible to finance those who cannot derive a profit at the given moment. Clearly, with allowance made for the repayment in the future of the debt, which was borrowed from the reserve insurance fund. Such a procedure facilitated maneuvering in scientific and technical activity and made it possible to create a fund for the financing of promising operations."

In short, time and money regulate the relations and clashes, which previously had not yet been perceived. The main goal of all the work is to produce with fewer forces and more rapidly more high quality scientific products. But their level is measured with allowance made for the competitive ability on the world market. The number of licenses for new types of materials, technologies, and products, which have been sold on the foreign market, including in Finland, Italy, and the FRG, not without reason is increasing here with every year.

When tallying the first results of the work of the research collective under the new conditions, here they ascertained that for the present a real reduction of the staff will not occur, but there will be a redistribution of manpower resources. On the other hand, the real output per scientist and specialist is increasing. The time of the completion of scientific operations is decreasing. The share of highly skilled personnel is beginning to increase, inasmuch as the institute has received the opportunity to free itself of dead weight.

But submerged rocks from various instructions and statutes, which often contradict each other, they told me in the Kalininskiy Rayon Party Committee of the capital, have still been placed in the way of the trailblazers by the Ministry of Finance, the State Committee for Labor and Social Problems, the State Committee for Standards, and their own Ministry of the Electrical Equipment Industry. Logic cannot be traced in the methods of establishing the standards of the payment to the state budget. Their substantiation is lacking. The mechanism, which is aimed at the increase of expenditures, and not at the achievement of the highest scientific production results with the least number of people, continues to operate, they believe at the institute. An orientation toward the derivation of a profit from the total amount of completed work has been adopted, while the questions of the efficiency of each development are receding into the background. The expenditures and the standard profit for the most part figure in the calculations of the price for the scientific product. While this can relax the attention of collectives to the efficiency of their developments. And after that self-financing and cost accounting for the present are still not helping the ship of sectorial science to make a sharp turn in the direction of industrial enterprises. As before with allowance made for state orders (up to 70 percent) scientific research institutes are performing work not for plants of their own sector, but for related ministries and departments.

But while maneuvering persistently among these submerged rocks, the scientific collective is continuing to lay a course for new horizons of research and discoveries.

7807

Institute of Genetics, Selection of Industrial Microorganisms

18140223 Moscow PRAVDA in Russian 3 Mar 88 p 2

[Article by M. Vasin under the rubric "Radical Reform:" "The Flower of Science in the Inclement Climate of Cost Accounting"; passages in boldface are as published; first two paragraphs are PRAVDA introduction]

[Text] The VNIIgenetika—the Institute of Genetics and Selection of Industrial Microorganisms—is one of the few research institutions in our country, which is engaged in the elaboration of scientific and production problems of biotechnology and genetic and protein engineering. The research, which scientists are conducting here, seems from the side to be strange and exotic, like tropical flowers in greenhouses. In many respects this is actually delicate shoots of what will become a part of our life and will become customary only tomorrow. These are interferons, interleukins, and other products, which the human body produces for the support of its vital activity and which bacteria are now being charged to synthesize, moreover, under the conditions of industrial production.

And now on the first workday of 1988 the "greenhouse door" flew open into present economic reality—the wind of cost accounting began to blow strongly into institute laboratories. How do the exotic flowers and those who grow them feel?

The time, when one had only to open the door, was most disturbing.

A year ago it became known at the institute that the changeover to the new conditions of economic management was being planned. They greeted the news with agitation. There were doubts and apprehensions. But there was also hope: for what was desired—independence—was behind the concepts "self-support" [samookupayemost] and "self-financing," which were strange to microbiologists and geneticists. What, as is known, young people long for.

But the VNIIgenetika is a young institute. And its construction was recently completed. And the average age of the scientific associates is a little more than 30. And the field of science, which is being developed by them, originated not that long ago.

At the institute they have organized economic training. They selected in a faultfinding manner the candidates for the council of the labor collective. They meticulously examined the outlines of the economic conditions, under which the collective had to live.

When it became clear that nearly all the restrictions and prohibitions had been lifted, several associates began to estimate recklessly what contracts they could conclude with plants—now, they say, it is possible at one stroke to increase the wage by three- to fourfold. The scientific potential of the institute and the already available reserve actually made it possible to expand introduction sharply.

But other scientists reasonably feared that such a tactic would require the serious reduction of theoretical and basis research, that is, the research which would then also turn into a "scientific commodity"—into new products and technologies. Plants will not pay for this work. Under presently existing conditions it is possible to pay for research, which will yield a return after a few, and at times after many years, only in accordance with state orders—from the state budget and from the assets of its own Ministry of the Medical and Microbiological Industry.

But what will the share of the state order in the plans of the institute be, will there be enough assets for the performance of theoretical work in the proper volume? The available reserve will suffice for about 3-4 years. But what then? There will be nothing to sell to industry....

The fact that for a long time it was also not clear to the partners of the institute through cost accounting interrelations—ministries and departments—what opportunities they had and to what framework they were limited also caused many anxieties. And although the executives of the institute starting last summer made the rounds of plants and conducted heated talks with directors and economists, until recent days it was not clear what price enterprises would be able to pay for the scientific product. Even the contracts with the ministry on state orders were altered on eight occasions and were delivered to the bank only on 31 December.

The bank was mentioned not without purpose: if guarantees of the solvency of the institutes had not given to it in the form of contracts, the bank would not have issued in January money for the wages of scientists. Precisely such a thing also occurred with one of the related institutes of the collective—the VNIIbiotekhnologiy: the institute did not bring to the bank contracts for the necessary amount, and the associates of the institute received in January only half the wage. True, in conformity with the new statute, the bank now issues loans for wages for half a year without sufficient collateral. But it is necessary to pay interest for the loan....

Cost accounting is rigorous.

And nevertheless the preparatory period concluded favorably. Contracts for the sum, which is necessary for the normal work of the collective, were concluded, the correct ratio, as they believe here, was established between the state order (67 percent of the budget of the institute) and direct contracts with enterprises (33 percent): this year they will not have to cut back basic research and to eat away the scientific potential. Although it turned out to be not at all so simple a matter to "pick up" this 33 percent, as it seems at first.

Corresponding Member of the USSR Academy of Sciences V. Debabov, director of the VNIIgenetika, commented as follows on this and the other problems, which already faced the scientists:

"For example, one of the plants should set up the production of an antibiotic which is very necessary for animal husbandry. But the strain at the disposal of the plant workers—a variety of microorganisms that produce this antibiotic—has a number of serious drawbacks. The institute succeeded in developing a good strain. The enterprise wants very much that we would introduce it. However, we still need to do much for this—to formulate laboratory regulations, then pilot industrial regulations, to check everything in detail. In short, 3 years are needed. But this does not suit the plant: 'Either shorten the entire time, so that the product would appear in 1988, or we will not conclude a contract with the institute.' There is a reason for such a statement of the question: agriculture is waiting for this preparation; the plant is in a difficult position, but, having completed the task, will derive a large profit. We, too, need this contract very much. We have to agree and to assume the obligation that we will complete all the work within a year. But for this it is necessary to regroup the forces of scientists and to alter the plans of a number of laboratories. For example, during the first quarter we are turning over the entire pool of our fermenters just for the elaboration of this theme. While we are postponing the remaining themes for half a year."

"But is the institute probably not capable of coping with a large number of similar 'emergency' developments?"

"That is why we could not confine ourselves to large orders—we also had to not balk at small earnings. We contracted to perform, so to speak, scientific service. Well, in particular, we are making enzymes for our own needs. We gave the surpluses free of charge to colleagues at the Academy of Sciences and at other scientific institutions. Now we have concluded contracts with several institutes—for about 5,000 rubles each—and are receiving from them a fee for 'scientific services.' Or, for example, we know well how to make gene banks. Everything has been set up here at our institute—we manage it in a week. But the specialists, who begin from scratch, need a year to assimilate this work. Clearly, they agree to pay 5,000-7,000 rubles, if only we would make the bank for them a little more quickly and would provide methods. We have much experience of work with bacteriophages—viruses which attack industrial microorganisms. In industry there are neither such specialists as we have nor the necessary equipment. But bacteriophages are

rampant in production. Therefore, the research institutions of the sector very willingly pay us 15,000 rubles so that we would train their specialists and would give advice.

"Not only does scientific service bring us income, it is also objectively very necessary. For this is the transfer of abilities, knowledge, and experience and the saving of time of the related industry. That is, scientific exchange is intensifying, the level of other research institutions is increasing.

"In short, the changeover of sectorial science to self-support [samookupayemost] is, undoubtedly, a positive step. Already now one can see with the unaided eye how the initiative of people has increased at the institute: they are seeking a user of the scientific product, are concluding contracts, are contemplating how to fulfill them a little more rapidly, and are finding reserves and unexpected solutions for this. They are working with spirit. For they know that if they do all this, they will receive bonuses and will guarantee that money will come into the funds of the institute."

"Hence, their importance in the collective will also increase...."

"Precisely! Those associates of ours, who have concluded major contracts with industry, are already walking about the institute proudly—they are breadwinners. While those, who are earning little and are putting little into the common pocket of the institute, feel discomfort.

"In preparing for the changeover to self-financing, we spoke and thought most of all about, so to speak, external cost accounting. But having only just appeared, it immediately drew after it internal cost accounting. One laboratory concludes a contract, but in order to fulfill it, it needs the assistance of specialists of another laboratory. And the plant laboratories stipulate in a businesslike manner and specifically the amount of this assistance, the time of its fulfillment, and with what and how it will be paid for.

"While working in accordance with contracts with industry, we will have to hire consultants and experts on the outside: with respect to several units of technology (the drying, for example, of the intermediate product) we do not have our own specialists. But it is possible to hire them at the expense of the saving of the wage fund and with the consent of the labor collective. Hence, everyone now is forced to think about how to save on the wage and to spend the saved assets as efficiently as possible. But this, among other things, will inevitably entail the reduction of the bureaucratic machine. In exactly the same way everyone will have to settle the question of institute transportation: how many passenger cars and buses the collective is to keep.

"It turned out: to lift the unnecessary restrictions in the activity of the institute means to unleash the initiative of people and to awaken in them practical thrift. I assume that with time we will have no fewer restrictions than before, but we are introducing them consciously and ourselves. While realized necessity is, as is known, also freedom.

"Incidentally," the director admits, "I never knew how much the heating of the institute cost: an estimate was drawn up, the state gave the money without objections. Now I have ascertained that we spend 80,000 rubles just on the heating of buildings. But we should earn them! You will necessarily ponder whether it is impossible to turn these 80,000 into 60,000, and even better into 40,000. Electric power is also expensive: we need distilled water, here we also installed distillers in the laboratories. Now we are reckoning whether it is not cheaper to set up centralized water supply."

"And how is it with the increase of the wage by three- to fourfold?"

"Of course, nothing of the sort happened. Sober calculations show that if we complete all the contracts, our average wage will increase by 10-15 percent. It was decide not to distribute this money uniformily, but to pay it to the associates, who are conducting the most important, priority development. This is approximately a fifth of our staff. It is they who will receive salary increments of 30-40 percent. That is, for a specific job and for the time of its completion.

"This is a powerful lever of the stimulation of the labor of researchers, but one which requires cautious, carefully thought out application. It is a matter of the following. It is easy to determine the most important developments among those which are being carried out for the plant. A major contract and a great cost are already evidence of the value of a job. However, if the 'breadwinners' greatly increase their wage and in subsequent years strive for the same thing, why would theoreticians not rush to wages, having put science aside? That is, the process of selling off the potential, which inevitably will have the result that in a few years it will be impossible to make the institute answer for anything, will begin. But it is already possible to detect such a trend in the moods. For the attitude toward the state order for the present remains the same as the attitude before toward the state budget: it would seem easy for us to get this money, and this is worthless. But then the money obtained from a plant is ostensibly completely different money, far more significant money.

"In reality the state order is a priority thing. Those filling it are working for the future of both science and the associates of the institute. In dealing with human proteins and new strains of microorganisms, researchers are working on most difficult tasks: here flexible, extensive knowledge, inventiveness, and talent are needed. Of

course, it is also necessary to stimulate the labor of these specialists, for they, and first of all they, are ensuring the well-being of the collective for years ahead.

"But how one is to single out from theoretical jobs the most promising ones and how and by means of what one is to give their authors incentives are a very difficult question, and at our institute there are many disputes in this regard. There also are, of course, other difficult questions. However, despite this, the collective likes the new system of management of the institute economy under the present specific circumstances. No one fears the worsening of the state of our affairs and our material status, no one doubts that we will fulfill our obligations to industry, although, honestly speaking, the terms of the contracts are very exacting.... Young people are treating the changes with especially keen interest. To subject to the uncompromising check of cost accounting oneself, one's own scientific developments, and one's own institute, to **a check for viability**—in this, you will agree, there is something tempting...."

So, apparently, this is a natural need of everyone who believes that he is doing a necessary job.

7807

Svetovod Interbranch Complex, Development of Fiber Optics

18140224 Moscow PRAVDA in Russian 26 Feb 88 p 2

[Article by PRAVDA special correspondent A. Tarasov under the rubric "The Complexes of Progress: We Are Studying a Problem": "The Paradoxes of Svetovod. The System of Optical Communications, Which Ceased Long Ago to Be a Novelty Abroad, in Our Country Is a Marvel. Why?"; first paragraph is PRAVDA introduction]

[Text] The other day an intelligent and energetic technical specialist told about the miracles which he saw during a foreign business trip. In the room of a Budapest hotel there is a magical television. There are 30 channels, including with access to information systems. The telephone is also rather good: in 30 seconds it will connect with any city of the world. These are miracles of fiber optic communication, about which we heard some 20 years ago as a scientific marvel. Here, they say, it turns out that a light signal, which runs through a glass fiber, can transmit the needed signal no worse than an electric signal can through a copper fiber. And even better and more rapidly!

Since then the advantages of optical communications have been repeatedly described in glowing colors (for the most part in our country) and have been repeatedly demonstrated (for the most part "there"). The estimation that its level is today as if a calling card of the state of scientific and technical progress has emerged. Unfortunately, we cannot present this calling card to the world. While we are taking comfort in the first lines between neighboring automatic telephone exchanges, the Orekhov-Borisov line, in the last resort the Leningrad-Volkhovstroy line and are beginning to connect Leningrad with Minsk, the world is already literally entangled in a web of fiber systems. New York and Washington over 350 kilometers simultaneously conduct with each other 240,000 telephone conversations via a single cable with a modest outside diameter of 12.7 millimeters. Abroad on the order of 1.5 million kilometers of optical communications lines have already been laid, more than 2 million kilometers of fiber are being produced annually. Two underwater optical lines are being laid: an 11,500-kilometer transpacific line (the United States—the Hawaiian Islands—Japan) and a 6,500-kilometer transatlantic line (the United States—Europe).

We merely smile distrustingly at the thought that it is possible from every house of some Kamchatka or Maritime village by a simple set to telephone any apartment of Moscow or Leningrad. It is even more difficult to imagine that in some countries they forgot about this problem long ago....

There is an element of fascination in the fact that the chief of the same design bureau, which is developing our domestic units for the drawing of optical fiber, told enthusiastically about the miracles of the Budapest hotel. Units, which are not yet in series production and which should pull us by the fiber thread from this lag.

That is what problem the Svetovod Interbranch Scientific Technical Complex is working on.

After the establishment of interbranch scientific technical complexes we took heart. A tractor, a tug, which will pull the stagnant and backward units of our scientific and technical revolution ahead, had been found. Time is passing—it is time to break loose. How is this happening?

Not having existed a year, the Svetovod-1 Interbranch Scientific Technical Complex, which had not been able to place the production of optical fiber on a practical footing, collapsed. I came to be at the Institute of Radio Engineering and Electronics of the USSR Academy of Sciences, the main organization of the former complex, a few days before the lowering of the flag. Dejection reigned. The accusations were unjustified. First, what is it possible to succeed in doing in such a meager time? Second, not having yet begun work, the interbranch scientific technical complex had already tested the departmental barriers for strength.

Doctor of Technical Sciences A. Sokolov, deputy director of the institute, told with bitterness about the failed plans: to gather all the problems of optical communications at one if only small works, where they are to be made a single problem. The institute does not have a works. The eight cooperating organizations of the complex belonged to seven ministries. The system of orders

and planning, although under the signboard of the interbranch scientific technical complex, as before remained agonizing. The technology of drawing optical fiber, which was developed by the Institute of Radio Engineering and Electronics, simply could not be embodied in domestically produced units. They wanted to put it through "from end to end," without dividing it into stages, which now are not joined, because if the glass makers "are deceptive" in the feed, the cable makers will not draw high-quality fiber from it by any contrivances. For the present these processes are in different ministries, which for 12 years know have been investigating who is to blame.

Thus, a roof, a roof for a single pilot works. But there was everything—currency and equipment, which had been dispersed among all ministries, there were rather good scientific developments—there just was not a roof. And it turns out that heaven knows what kind was required.

"We made the rounds of old and unprofitable plants of Moscow and Moscow Oblast, of which the managers themselves would have been glad to get rid. In Krasnaya Presnya there is the Teasvet Plant, a very inadequate one. We proposed to modernize it, to produce for 5 years their own product, theater lighting, to increase its level, to develop holograms for them, and to supply them with special radio equipment—if only to use this roof also for our own work. Nothing came of it—the plant is too dear to the Ministry of Culture. We found in Stolbovaya an unfinished enterprise of the Ministry of the Electrical Equipment Industry, there they are drying hay in the building. They also did not provide it. In Ramenskiy Rayon we aimed for the collapsed premises of the Gzhelskiy Enterprise for Tiles and Polyethylene, but again missed...."

In the State Committee for Science and Technology they reasoned that access of an academic institute to production is actually complicated. Moreover, specialists explained to me, the themes of the Svetovod Complex were too dispersed. Both the fiber itself with the technological equipment for its drawing and a large number of other elements of the system. Meanwhile now the fiber itself and the optical cable made from it are the decisive and most difficult section. Is it not simpler to transfer the complex to an industrial ministry? Here the decision on a new main organization, which unites scientific forces with a powerful production base, also suggested itself. The scientific production association of the All-Union Scientific Research Institute of the Cable Industry of the Ministry of the Electrical Equipment Industry. Doctor of Technical Sciences I. Peshkov, its director, also became the general director of the complex. The scientific supervisor is Academician A. Prokhorov, director of the Institute of General Physics of the USSR Academy of Sciences.

Here it is necessary to speak about the junction between scientific and production problems. Imagine a light pulse which runs without losses through a glass filament from Moscow to Novosibirsk and farther to Vladivostok. What should this glass be like? It is clear that it should not be window glass. They began with light guides, in which the optical losses weakened the light by a factor of two on every meter of the path. It is clear that here you will not make it to Vladivostok. But it is also necessary to be concerned about the strength, flexibility, resistance to cold, and many qualities, which ensure the mass and trouble-free use of light guide communications. Under the conditions of cost accounting the price of optical cable also worries communications workers. Why are they to spend money, if copper cable is cheaper? Scientists of the same Institute of Radio Engineering and Electronics and the Institute of General Physics of the USSR Academy of Sciences in collaboration with colleagues from the Institute of Chemistry of the USSR Academy of Sciences are working not without success on these problems. Their achievements at times are not inferior to world achievements. For example, the optical losses have been reduced to a minimum—the light weakens by a factor of two already at a distance on the order of 20 kilometers.

However, series production on domestic equipment is still in an embryonic state. Foreign firms draw glass filaments more rapidly, stronger ones and longer ones.

Cable makers, having received the assignment to twist glass cable, several years ago were pleasantly surprised. But this proved still to be half the matter. At first they twisted it from imported fiber. But now they have been charged also to draw the fiber itself. But they are not drawing copper wire. However strange, they had to go into the details of high-speed glass drawing, sharing in essence a single process with enterprises of quite distant glass production of the Ministry of the Construction Materials Industry. A great psychological change and a campaign for the increase of the fineness and precision of production and the introduction of unheard of measuring equipment, which checks all 100 percent of the output, are under way. But the main problems, of course, are at the meeting points. There are very many of them, and each one requires particular precision.

V. Berson, chief of the special planning and design bureau of the All-Union Scientific Research Institute of the Cable Industry, is supervising the designing of a three-story drawing unit, which will place glass filament into mass production. And he is beginning with the search for related industries, which will provide the necessary measuring devices. The first discovery, he says, is: in the country there are no pyrometers, which are capable of measuring a temperature on the order of plus 2,400-2,600 degrees to the nearest 0.5 degree. There are no diameter gauges, which ensure the precision of the filament to a fraction of a micron in the dynamics of drawing. There is no system which tracks the deviation of the filament. While in the light guide the geometry alone matters: so that the quartz middle of the fiber would not deviate by a fraction of a micron from the strict center over hundreds and thousands of kilometers.

No, no, no.... For the most part the gauges of such a class on our machines are imported. Without gauges there is no precision automatic machines, without precision automatic machines there is also nothing with which to start such work. Talks are beginning with the Ministry of Instrument Making, Automation Equipment, and Control Systems, the Ministry of the Electronics Industry, and scientists of academic scientific research institutes and higher educational institutions, often outside their plan, at their own consent. That is, the same thing that also existed prior to the interbranch scientific technical complex. Where are its levers?

The levers are in the hands of the general director. Let us drop in on him for advice. Here 8 ministries and almost 20 institutes, enterprises, and design bureaus of different departments are represented.

The problem had been just a single one—and now it has already scattered like a ball of mercury into tens of more beads.

The drawers from cable enterprises (the Ministry of the Electrical Equipment Industry) assert that everything rests on the blanks of too low quality, which are received from the glass industry. The glass makers from the Leningrad State Scientific Research Institute of Quartz Glass and two enterprises of Gus-Khrustalnyy cite once again the lack of precision measuring equipment, automatic machines, which regulate the feeding of complex gas mixtures, and so on.

It is possible to understand them. The construction materials industry is well known for its concrete and brick strength. Dust, heat, rumbling, and smoke are more characteristic of it. Window or plate glass is already a masterpiece of fineness. But here production under the conditions of unprecedented cleanness and precision, production of "clean hands," as they succeeded in calling it and to which we have not yet become accustomed on the scale of the entire country, is actually being assimilated.

A twist—and the glass filament loops in the direction of the Ministry of Instrument Making, Automation Equipment, and Control Systems, which disrupted the delivery of metrological equipment. A tangle instantly forms. Another zigzag—it sticks in the refusal of the chemists of the Kriogenmash Association to make a modern container for the transportation of gases. And thus it is precipice after precipice, tangle after tangle.

"That is how we will get to the ore," the general director repeats every time more sadly. "The tragedy is that each such problem is not the main one for the immediate performer. He is up to his neck in his own concerns. There are methods of stimulation. Participation in the developments of the interbranch scientific technical complex is being stimulated by the retention of a portion of the profit, which would go into the funds, and by exemption from several deductions. But when for the enterprise the order of the Svetovod Complex is only a fraction of a percent of the total production, these crumbs will be more expensive. Moreover, not all ministries agree to finance the orders of the interbranch scientific technical complex. The Ministry of the Chemical Industry, for example, is responding with a refusal—pay for it yourself.

"If we had in our hands all 15 million rubles, which are planned for the year for the scientific research and experimental design work of the interbranch scientific technical complex," Izyaslav Borisovich dreams, as any general director probably does, "we would be serious clients, those who are thinking in earnest about profitability and cost accounting would treat us with respect."

I recently asked USSR Minister of Finance B. Gostev this question at a meeting at the editorial office. Why are they not putting the assets, which are being allocated for the problem of the interbranch scientific technical complex, into one main hand, but are dispersing them among a large number of departments, by which they are also weakening this lever? "I do not know..."—such was the response of the minister.

The dreams of the "brain trust" have also not changed. Doctor of Technical Sciences Ye. Dianov, who heads the Fiber Optics Department of the Institute of General Physics of the USSR Academy of Sciences, just as his colleagues at the Institute of Radio Engineering and Electronics recently did, considers unsound the practice of splitting up one assignment among a large number of ministries and departments. The units for the production of supporting quartz tubing and blanks, which precede the drawing of the fiber, were distributed for use to tens of enterprises of different types. The technological equipment was divided among ministries: mechanics to one, automatic machines to another, the heat block to another, the chemical block to another. It is doubtful that a harmonious whole will result from this.

Once again: Why should the interbranch scientific technical complex not "buy a small plant," if it is necessary to concentrate efforts? This would be an example of the radical nature of reform.

And here another gross absurdity, in my, perhaps, excessively naive opinion, emerges. It is not necessary to establish such a specialized enterprise. It already exists. One of the design bureaus of the Ministry of the Electronics Industry in bygone times, when everyone was working on the glass fiber problem in his own way, achieved success in the development of its own technological equipment. From the supporting quartz tubing, through the blanks—the drawing of optical fiber. Including the desired monitoring equipment, a microprocessor control system of long awaited domestic design, which is not inferior, in the opinion of specialists, to analogs of the foreign firms Rosendahl (Austria) and Spatial Gas Controls (England) and to others....

You experience a sense of legitimate pride when you learn this. Still we also have golden minds. Yet who had doubts? But at the same time there is also a sense of profound bewilderment. The optical fiber function of the design bureau was confined to this. The managers of the interbranch scientific technical complex are literally "hungrily eyeing" it, specialists themselves for more than a year have been writing about their willingness to serve the cause on the state scale. But neither the Academy of Sciences nor the State Committee for Science and Technology is responding to them. "I and many colleagues of mine have an alternative opinion on the great potentials of small enterprises like design bureaus with pilot plants," chief engineer O. Andreyev writes the editorial office. "Why not at the same time as the existence of large complexes also grant independence when working on national economic tasks to small enterprises, which have a scientific and technical reserve and have the opportunity to manage flexibly their own manpower and material resources?"

For the present it simply is not turning out—neither simultaneously nor in combination. The departmental fence at times, it seems, does not have either a gateway or a wicker gate in order to be linked with state concerns. Is it really more profitable to throw in crumbs newer and newer millions of rubles for their futile trampling? And will the radical nature of radical reform appear here?

The paradoxes and tangles of the Svetovod Complex suggest these questions not only for the sake of the interbranch scientific technical complex alone.

7807

New Members of Ukrainian Academy of Sciences

18140225 Kiev PRAVDA UKRAINY in Russian
17 Jan 88 p 3

[Article: "At the Ukrainian SSR Academy of Sciences"]

[Text] In conformity with the announcement of the Ukrainian SSR Academy of Sciences the regular election of full members (academicians) and corresponding members of the Ukrainian SSR Academy of Sciences has been held. The held election was the largest in the entire history of the academy. This is explained by the fact that by the decree of the CPSU Central Committee and the USSR Council of Ministers of 5 February 1987 the USSR Academy of Sciences and the academies of sciences of the union republics were granted the right to declare vacant the posts held by academicians who have reached the age of 75.

In all 59 candidate full members (academicians) and 199 candidate corresponding members of the Ukrainian SSR Academy of Sciences were nominated for the declared vacancies by full members and corresponding members of the academies of sciences, by the councils of scientific institutions and higher educational institutions, and by state and public organizations.

A peculiarity of the present election consists in the fact that this is the first election during the period of restructuring. It accomplished the important tasks of ensuring the rapid development of priority scientific directions and enlisting in the work in them the most talented scientists, who are capable of making a significant contribution to science and of heading research collectives. The task of the substantial rejuvenation of the staff of the academy was also accomplished. The average age of the scientists, who were elected to the Ukrainian SSR Academy of Sciences, is 11 years less than the age of the academy members of the previous staff.

Increased demandingness on the selection of candidates and a greater democratic nature distinguished the election. This found reflection in the careful selection of candidates and their comprehensive discussion with the participation of the scientific community at large. For the first time, for example, the nomination of candidates by scientists and scientific and technical councils was carried out on the basis of the results of a secret ballot. At the same time the Presidium of the Ukrainian SSR Academy of Sciences, which discussed the results of the election, deemed it necessary to prepare suggestions and to take the appropriate steps on the further improvement and democratization of election to the Ukrainian SSR Academy of Sciences.

The General Assembly of the Ukrainian SSR Academy of Sciences on 15 January 1988 in conformity with the charter elected:

As Full Members of (Academicians) of the Ukrainian SSR Academy of Sciences:

For the Mathematics and Cybernetics Department

Berezanskiy, Yuriy Makarovich

Danilyuk, Ivan Ilich

Yermolyev, Yuriy Mikhaylovich

Sergiyenko, Ivan Vasilyevich

For the Mechanics Department

Lebedev, Anatoliy Alekseyevich

For the Physics and Astronomy Department

Volkov, Dmitriy Vasilyevich

Dmitrenko, Igor Mikhaylovich

For the Earth Sciences Department

Belyayev, Valeriy Ivanovich

For the Physical and Technical Problems of Materials Science Department

Zelenskiy, Viktor Fedotovich

Kuchuk-Yatsenko, Sergey Ivanovich

Naydich, Yuriy Vladimirovich

Svechnikov, Sergey Vasilyevich

For the Physical and Technical Problems of Power Engineering Department

Dolinskiy, Anatoliy Andreyevich

Schastlivyy, Gennadiy Grigoryevich

Chizhenko, Ivan Mironovich

For the Chemistry and Chemical Technology Department

Andronati, Sergey Andreyevich

Markovskiy, Leonid Nikolayevich

Skopenko, Viktor Vasilyevich

Chuyko, Aleksey Alekseyevich

For the Biochemistry, Physiology, and Theoretical Medicine Department

Grishchenko, Valentin Ivanovich

Frolkis, Vladimir Veniaminovich

For the General Biology Department

Gleba, Yuriy Yuryevich

Romanenko, Viktor Dmitriyevich

For the Economics Department

Pakhomov, Yuriy Nikolayevich

Chukhno, Anatoliy Andreyevich

For the History, Philosophy, and Law Department

Mamutov, Valentin Karlovich

For the Literature, Language, and Art Department

Dzeverin, Igor Aleksandrovich

As Corresponding Members of the Ukrainian SSR Academy of Sciences

For the Mathematics and Cybernetics Department

Kuntsevich, Vsevolod Mikhaylovich

Morozov, Anatoliy Alekseyevich

Petrina, Dmitriy Yakovlevich

Petrov, Vyacheslav Vasilyevich

Samoylenko, Yuriy Ivanovich

Fushich, Vilgelm Ilich

For the Mechanics Department

Grinchenko, Viktor Timofeyevich

Martynyuk, Anatoliy Andreyevich

Prisnyakov, Vladimir Fedorovich

Smetanin, Yuriy Alekseyevich

For the Physics and Astronomy Department

Zalyubovskiy, Ilya Ivanovich

Men, Anatoliy Vladimirovich

Soskin, Marat Samuilovich

Tsymbal, Lyudmila Trofimovna

Sheynkman, Moisey Kivovich

For the Earth Sciences Department

Zabigaylo, Vladimir Yefimovich

Matyash, Ivan Vasilyevich

Sobotovich, Emlen Vladimirovich

Shestopalov, Vyacheslav Mikhaylovich

For the Physical and Technical Problems of Materials Science Department

Andreykiv, Aleksandr Yevgenyevich

Naydek, Vladimir Leontyevich

Seminozhenko, Vladimir Petrovich

Firstov, Sergey Alekseyevich

For the Physical and Technical Problems of Power Engineering Department

Volkov, Igor Vladimirovich

Stogniy, Boris Sergeyevich

For the Chemistry and Chemical Technology Department

Karp, Igor Nikolayevich

Lebedev, Yegeniy Viktorovich

Popov, Anatoliy Fedorovich

Strelko, Vladimir Vasilyevich

For the Biochemistry, Physiology, and Experimental Medicine Department

Belous, Apollon Maksimovich

Yelskaya, Anna Valentinovna

Moybenko, Aleksey Alekseyevich

For the General Biology Department

Vasser, Solomon Pavlovich

Tarabrin, Viktor Pavlovich

For the Economics Department

Beschastnyy, Leonid Konstantinovich

For the History, Philosophy, and Law Department

Dobrov, Gennadiy Mikhaylovich

Kuras, Ivan Fedorovich

Tolochko, Petr Petrovich

Shemshuchenko, Yuriy Sergeyevich

For the Literature, Language, and Art Department

Akulenko, Valeriy Viktorovich

Nepokupnyy, Anatoliy Pavlovich

The new detachment of scientists, who have been elected members of the Ukrainian SSR Academy of Sciences, are called upon to speed up the solution of basic problems of the natural sciences, technology, and the social sciences, to make fundamental breakthroughs in the most promising directions of scientific and technical progress, and to ensure the achievement of the world level along the expanding front of modern science. The significant increase of the practical return of research and the increase of the real contribution to restructuring and the acceleration of socioeconomic development are a responsible task of the newly elected members of the academy.

The lofty humanistic mission of active participation in the movement for a more perfect world without wars and weapons, for the establishment of new, truly equal international relations, and for the solution of vitally important ecological problems is being assigned to the new members of the academy.

The newly elected social science scholars will focus their efforts on the in-depth theoretical elaboration of the economic, social, and legal aspects of the restructuring taking place in the country and the extensive democratization of Soviet society. The creative elaboration of the problems of the cardinal economic reform and the changeover of enterprises to the new conditions of economic management is their most important task. They are called upon to make their contribution to the elimination of what are called "blank spots" in the coverage of a number of periods of history and to the theoretical elaboration of the laws and contradictions of the development of society and the problem of man in the broadest sense, including the formation of his spiritual world.

7807

Director Defends Design Office Work

18140257 Baku KOMMUNIST AZERBAYDZHANA in Russian No 2, Feb 88 pp 92-95

[Article by N. Suleymanov, director of "Kristall", A Special Design-Technological Office for Metals Science [Metallovedeniye], candidate of technical sciences: "This Difficult Path of Introduction"]

[Text] **For eight years now our Academy organization has been on full cost accounting. We introduce our developments at various enterprises. In this regard we are in a more advantageous situation than other scientific institutions which switched over to cost accounting in January 1988. We have considerable experience in the contract based introduction of innovations into the economy. Analyzing materials from the June (1987) CPSU Central Committee Plenum, I have come to this conclusion: Stagnation in our economy was to a great extent due to neglect about the introduction of highly effective technology. Such an approach to mastering innovations was caused by various barriers and the aspirations of numerous collectives at sectoral institutes for a quiet life. They therefore did not open the way for "strange" innovations.**

Using our organization, "Kristall" A Special Design-Technological Office for Metals Science, Azerbaijan SSR Academy of Sciences, I will show how this "brake on progress" operates.

First of all, a few words about the scientific essentials of our developments, as our persistent opponents assert that we are simply experimenters and there is no science in our developments. In fact, first there was there was the discovery and development of the scientific principle for creating a highly dispersed structural state in steels, the implantability of tungsten and molybdenum on metals was proven and then began the search for possible ways of eliminating excessive amounts of these components and the large fragments of primary carbides. An entire range of authors certificates for new steels and methods of strengthening them indicates not only a positive effect, but also the world wide novelty of the principle we discovered. Also, we invited all opponents to an expanded meeting of the Section for Physical-Technical and Mathematical Sciences at the USSR AN Presidium, at which there was an evaluation the scientific essentials of our developments. There turned out to be no dispute. The game, as they say was "all at one end of the field." One after another, well known metals scientists scientists acknowledged the originality of the scientific principle upon which the introduced work was based. Academician G. Kurdyumov: "The authors have shown that ...one can successfully replace expensive tungsten containing high speed steels with less expensive ones—without tungsten." Professor M. Shtremel: "Fop 80 years all high speed steels have been produced through small variations around a single optimum. The innovation in this work is that two processes have now been derivied. This has given a new degree of freedom. Using this principle one can create not only presently offered but many other steels. The Azerbaijan Academy should work on this—there are great promises here."

The decree by the USSR Academy of Sciences Presidium Section states: "Thanks to their special structure, the new steels have increased strength in combination with high ductility and resistance to shattering." Thus, the staff of the "Big Academy", noted unanimously: "There can be no doubt about the joint proposals of "Kristall" and several other scientific organizations in the country." However, this did not at all shake the opponents of innovations. Our opponents take no notice of the huge economic benefits obtained from the introduction of non-tungsten steels at dozens of enterprises: KamAZ [Kama Motor Vehicle Plant], LOMO [Leningrad Optical-Mechanical Association], the Aviation Production Association in Kiev, the Motor Building Production Association in Ufa and others.

What moves opponents of introduction? What are their goals? Why are they hindering the extensive introduction of the steels we developed?

Most suprisingly, any doubts they express (even those for which there is no basis) are accepted and attentively examined. How much trouble and torment it has been for us to prove the groundlessness of these doubts and to show that we are correct! Generally, we have succeeded. But then new doubts arise, and so it goes on endlessly. Even though none of the dozens of complaints and doubts about non-tungsten steel have been proven, not one of our opponents have been punished for this fraud. I foresee the question: Perhaps nobody needs our work to improve the efficiency of metalworking? This is not true! Our country is vitally interested in it.

It is paradoxical that departmental and sometimes even personal interests are opposed to state interests. Their positions are strng.

I will explain the situation in more detail. As is known our state is putting top priority upon resource conservation. During perestroyka in the economy it is resource conserving technology which plays a main role. The development of non-tungsten steels at "Kristall" is a complete solution to questions in economizing upon tungsten when producing high speed steels. The state is saved up to 60 kilograms of scarce tungsten and 20 kilograms of equally scarce molybdenum in the production of each ton of such steel. The entire problem is that neither Minchermet [USSR Ministry of Ferrous Metallurgy] nor Minstankoprom [USSR Ministry of the Machine Tool and Tool Building Industry] find it profitable to produce the less costly metal and tools made from it because this reduces gross output indicators.

Also, there is a small group of scientists who for a long time have been wanting to create their own non-tungsten steels, which, in contrast to ours, are not in demand by industry. It is our misfortune that these scientists have considerable authority and are usually in various commissions for evaluating new tool materials. It isn't difficult to guess how the "war" between us will turn out. I will give several examples.

In 1982 USSR Gosplan, the GKNT [USSR State Committee for Science and Technology] and the USSR Academy of Sciences approved a plan of measures to introduce non-tungsten steels. It was intended to smelt 1,700 tons of metal, manufacture tools from it and conduct tests which would make it possible to draw some conclusions about the more extensive use of these steels in the 12th Five-Year Plan. A special interdepartmental commission was set up at the GKNT to prepare recommendations on the scale of introduction. To accelerate development we presented USSR Gosplan with data on tools made from this steel which had already been tested in 80 enterprises throughout the country by 1982. Here, however, it was explained that it was not profitable for enterprises to produce this cheap metal. Therefore, Minchermet did not meet its targets, explaining this was due to "overloaded capacity." Naturally, no metal meant no tools. This allowed another ministry, Minstankoprom, to avoid meeting its targets. During 1983-1985 it processed only 13 tons of steel. With such small volumes how can one talk about extensive testing?

Why was nothing done by the commission entrusted with observing and controlling plan fulfillment? The commission sat on its hands. By hook or by crook it proved the lack of prospects for non-tungsten steels and

attempted to belittle and misrepresent their properties. The individuals on the commission were selected skillfully so that they were mainly representitives from Minchermet and Minstankoprom and specialists who had unsuccessfully attempted to introduce their own non-tungsten steels. They operated according to the principle: "If it is unprofitable to the sector (or to me) to introduce introduce the steels developed by the people from Baku, then everything possible must be done to see that they do not obtain a 'start on life'."

For example, a commission member, Professor A. Gulyayev, a doctor of technical sciences, asserted that these steels were difficult to grind and polish. According to his calculations, the difficulty of grinding, polishing and finishing operations increased exactly 49 (forty nine!) fold compared to tools made from standard steels. This assertion by A. Gulyayev was seriously discussed at superior organs—so great is this scientist's authority, and he shamelessly uses it. Before talking about such data, a metals scientist with even the slightest knowledge should have thought: is it true that this steel is several times harder than a diamond (!), the hardest material known? Our little known specialists found out something which did not occur to this well known scientist. They went to a drill plant, compared data and found ...deception. It turned out that during testing the decimal point was shifted two places to the right. An innocent 0.49 became a terrible 49.0. Shouldn't this be cause for alarm. Gulyayev did this.

Here is another example. S. Tirshayev, a former director of the main institute at Minchermet, asserted: "The introduction of non-tungsten steels will cause losses totalling 5,000 rubles for each ton of tools." His assertion was also quite seriously examined by the commission. It turned out that similarly to A. Gulyayev, S. Tishayev, based his argument on grinding and polishing data from the drill plant. Must we once more have to explain how this mistake, which has already been revealed, has again been used against non-tungsten steels?

Take the tool test results at the "Frezer" Plant. Meetings of the Interdepartmental Commission repeatedly discussed negative results. We again started explaining the reasons. It turned out that there were mix-ups of grades and heats during the manufacture of 63,000 tools. Naturally, this led to defective items. It was known about these defects—there was a plant document. What did our opponents do prior to this document? They sent these defective tools for testing.

One can give dozens of such examples. Another thing is surprising. Why should the discoverers pay for these falsifications? How can we pay, a small collective, oppose very powerful people and organizations? So far nobody has been punished for the heavy material damages inflicted upon the state.

The commission finished its work, the essence of which was to, at every session, discredit innovations in every way possible. A new commission means new testing, analysis of results and again, powerful resistance by our competitors.

The introduction of new steels and accelerated solutions to problems requires eliminating all evaluation, coordination and decision making link between innovators and using enterprises, as the manager of each link needs as many documents as possible to substantiate his decision. This turns managers into a bureaucrat. The decision they make after prolonged work and huge expenses usually remain unimplemented, as they have the form of a recommendation to introduce something new, but without coordinating state interests with the interests of manufacturing and using enterprises.

Naturally, our collective did not only explain the obvious to these commissions, but caught the forgeries. Since the day it was founded, seven years ago, "Kristall" has been on full cost accounting. Therefore, we propose to enterprises with which we have signed contracts to take and test our metal. We have their most active support. Plants and associations which have used our non-tungsten steel remain our adherents forever. Here, however, is an insoluble problem: How can we obtain this steel in the needed volumes? After all, the SKTBM has limited potentials. We can only supply small amounts of steel so it can be "handled" and tested. Centralized supplies are needed, but here we have the "friends" from Minstankoprom.

Filling orders for steel requires permanent technical specifications regarding its smelting. Even though Elektrostal and Dneprospetsstal long ago mastered the production of our steel, it cannot be deliveried without approved technical specifications. A document has been compiled, but final agreement on it has been under way for more than a year.

Enterprises themselves must answer questions in the accelerated introduction of new steels, taking their own problems into account. These are serious problems: plants using this steel must agree to buy it with the limited funds for steels they have long been using and undertake the unavoidable problems of introducing inovations. Users prefer not to hurry in replacing steels they have long been using. As a result, the pace of introduction is slowing.

The producing and using enterprises' interests in the production of new steels require specific measures to provide incentives to replace standard steel with new grades. One effective measure would be to provide a 10-15 percent markup for each ton of steel replaced. This would cover the chronic shortage of high speed steels. The economic benefits from introducing the new steels would decline, but not by much. The consumption of

scarce molybdenum would remain the same. The users interest in introducing new steels would accelerate the process and assure real savings in tungsten.

This proposal will bring objections from metallurgists pointing to the lack of capacity to increase the production of high speed steels. Given the present situation the optimal decision would be for some of the resources allocated to develop new ore deposits to be used without hurting users' interests. The ore conserved by science would be somewhat less costly than that extracted at new mines.

One can still talk about barriers in the way of introducing the steel offered by "Kristall." However, it is time to sum up results from our experience in introduction. First: it is necessary to eliminate the anti-cost mechanism so that it will not be advantageous to anybody to use more expensive materials or labor intensive processes. Second: Protect innovators from the negative influences of opponents. Let every developer make his own way on a competitive basis. Those who are better will get the green light, without any agreements or commissions. Third: Increase the responsibility of individuals for deliberately false recommendations, the falsification of results and improper conditions for testing. Fourth: Re-examine existing instructions and simplify paper flow involving the introduction of innovations. It is no secret that filling out various forms and making agreements takes more time than does development itself. The number of signed documents should be sharply curtailed. Finally, create more favorable conditions for organizations solving important state problems. State orders should be supported not only by allocations, but also by specialists, equipment and production area.

In conclusion I would like to add that in spite of the huge difficulties which we had to overcome in introducing new developments, the "Kristall" collective is confidently looking to the future. The decisions of the June (1987) CPSU Central Committee Plenum are creating harmonious conditions. Rapidly mastering modern technology and efficient materials we can raise our machine building to new scientific and technical levels.

11574

Technical Board of Moldavian Scientific, Technical Cooperative

18140226 Kishinev SOVETSKAYA MOLDAVIYA in Russian 17 Feb 88 p 2

[Interview with Eduard Arkadyevich Snidchenko, director of the TRAMPLIN Technical Board of the Vizir Scientific and Technical Cooperative Attached to the Moldavian Republic Council of the All-Union Society of Inventors and Efficiency Experts, by SOVETSKAYA MOLDAVIYA correspondent I. Stasov under the rubric "A Topical Interview": "A Leap From TRAMPLIN"; date, place, and occasion not given; first paragraph is SOVETSKAYA MOLDAVIYA introduction; last paragraph is SOVETSKAYA MOLDAVIYA conclusion]

[Text] The technical renovation, automation, mechanization, reequipment of light industry—the first letters of these words form the abbreviation TRAMPLIN. This is both the name and the purpose of the recently established technical board of the Vizir Scientific and Technical Cooperative attached to the Moldavian Republic Council of the All-Union Society of Inventors and Efficiency Experts. So that it would be more understandable and easier, let us define TRAMPLIN as a kind of "subsidiary" of the Vizir Cooperative. Judging from its full name, it intends to deal with the technical improvement of enterprises of light industry. What predetermined the choice of precisely this direction? For why saddle oneself with such a burden, which, as is known, is within the power of far from all enterprises of the state sector? Would it not be easier to take beaten, sure paths? Eduard Arkadyevich Snidchenko, the director of TRAMPLIN, responses to this and other questions of our correspondent.

[Answer] Here is the point of view on the problem of choice, which all the members of the cooperative support. It was formulated as a result of detailed acquaintance with enterprises of light industry of the republic: obsolete and worn out equipment is getting on alongside modern equipment. Automated technological processes in contrast to the lack of means for the mechanization of many operations, moreover, quite simple ones. Highly productive labor is being combined with manual labor. Everything is comparatively simple at first glance. However, then close acquaintance with the technical side of the "coin" changed drastically our initial attitude toward the complexity of the problem of the technical equipment of enterprises of light industry. It, this problem, to a great degree requires the undoing of intricate stratagems and accumulated technical contradictions. But precisely such "labyrinths" also always attracted inventors and creatively thinking specialists. It is clear that under all these conditions our Vizir Scientific and Technical Cooperative and the TRAMPLIN Board, which was set up under it, could not remain aloof of the solution of vitally important problems.

[Question] In short, the inventors, who are members of the cooperative, decided to help the sector, having become imbued with its concerns and problems. Has TRAMPLIN already given light industry anything, or are they just preparing it for leaps in pursuit of scientific and technical progress?

[Answer] First of all it is important to note that for TRAMPLIN, although it is not a charity organization, there are no profitable and unprofitable orders. We undertake the solution of all the technical problems, with which clients turn to us—beginning with the development of minor attachments and ending with large technological complexes, moreover, we take upon ourselves their production. One of the examples: on the order of the Bendery Garment Factory imeni 50-letiya VLKSM an automated vertically adjustable center of the overlay of fabrics (the Tsentavr-1) was produced. Today the overlay of fabrics prior to cutting is one of the most labor-consuming and least productive operatives. Suffice it to cite the following figures: during one shift two

workers, who attend the table for the overlay of fabrics, have to transfer up to 1.5 tons of fabric and to pull about 2 kilometers of fabrics by hand, having walked in so doing about 4 kilometers along the table. The Tsentavr-1 will increase labor productivity by twofold and will free eight workers.

Another example is the order of the Soroki Garment Factory, which was sent to us by the republic Ministry of Light Industry and includes a list of 10 technical problems which encompass all the technological units of production. The on-site analysis yielded the following results: a draft contract for the solution of seven problems has already been prepared, TRAMPLIN will complete all the work already this year; the enterprise will solve two problems on its own—fresh ideas have appeared, one theme has been temporarily postponed until the completion of the renovation of the factory. As you see, the pace is such a one, about which "light industry workers" previously could only dream.

The overall results of the work of TRAMPLIN are: in the 3 months of our existence the amount of the contracts comes to 100,000 rubles, a package of orders for the same amount is in the works, business contacts have been established with four large enterprises of the sector, at which comprehensive programs of technical improvement will be implemented. But the main thing is not the volumes and figures, but the fact that behind every ruble is new modern equipment, for which light industry has been waiting so long.

[Question] Who works on TRAMPLIN and do you have the problem of a shortage of specialists, which is usual for state research centers?

[Answer] In conformity with the general principle of scientific and technical cooperatives the bulk of the specialists work during the time off from their basic job. TRAMPLIN is oriented toward creative groups of three to five people, as a rule, colleagues, each of which is capable of performing the entire amount of planning and design work. Taking into account that the final product of our activity is the production of equipment, we enlist workers of the most different specialties. There are also orders for inventors who work on their own, to whom we try to suggest several themes, while if necessary we select for such "forwards" the necessary assistants. The main thing is that we rely on the republic bank of specialists, inasmuch as we are confident that the republic has scientific and technical personnel who are capable of solving the most difficult problems, it is merely necessary to find them and to organize the work. And, of course, we need engineers of the most different specialties—mechanical engineers, electronic engineers, chemists, and designers.

[Question] What are the basic directions of the technical improvement of the sector, which have been outlined by TRAMPLIN for the immediate time to come and for the future?

[Answer] In the next 2-3 years we intend to solve the basic key problems on the mechanization and automation of the most labor-consuming processes and operations by the development and production of individual types of technological equipment. During the next five-year plan we will begin the development of sets of equipment, which encompass the entire technological cycle of enterprises of light industry. By the same time we hope with respect to individual types of equipment to appear on the international market. We regard as the main unit in this work the development of qualitatively new technologies in the very production of items of light industry, on the basis of which we will carry out the production of new types of equipment. For us the turnkey building of medium and small enterprises of light industry—starting with the structural components of buildings and ending with the installation of all the necessary equipment—is, if it is possible to put it this way, the fondest dream. Such small enterprises can become kinds of "industrial studios," which operate on the basis of flexible, quickly readjustable production lines.

[Question] What are the basic reserves of the sector and the possible means of their use?

[Answer] It is always possible, of course, to find reserves. But we are firmly convinced that here there is the production waste of the sector. The secondary raw materials of light industry are truly "a bag of gold," which is tied up with a very intricate and tight knot. One of the main tasks, which TRAMPLIN is now setting for itself, is to untie this knot, having afforded access to the efficient use of secondary raw materials, moreover, for its needs. We already have clients.

[Question] Is TRAMPLIN experiencing production difficulties and how is it overcoming them?

[Answer] In the immediate future TRAMPLIN is beginning the production of complex technological equipment. And whereas the question with the experimental laboratory is at the stage of settlement, the practically complete lack of a production engineering base is greatly limiting our possibilities. Of course, we are trying to place our orders at enterprises of the republic, but this is a temporary solution of the problem. Meanwhile it is possible to find another, efficient means. It is obvious that in the sector there are enterprises or sections and shops, which are obsolete and worn out and do not justify their purpose and existence. It is possible to attach one of them to us, having transferred the production space to TRAMPLIN. We understand that such a decision contains an element of risk, but it is justified, and we are willing to bear the responsibility for this result. Acceleration is a quantity which is inversely proportionate to the expenditures of time, which now is, without exaggeration, more precious than gold. Now,

when TRAMPLIN is in fact performing the functions of a sectorial scientific and technical center, we have the right to count on the assistance of light industry of the republic.

[Question] The basic product of light industry is consumer goods. What will the contribution of TRAMPLIN to the accomplishment of this task be?

[Answer] The work on the technical improvement of enterprises of light industry is aimed directly at the improvement of the quality of consumer goods. But serious and purposeful work on the development and introduction of advanced technologies, starting with the production and processing of raw materials and further the entire technological chain of production, is necessary. Precisely this is also one of the main directions of the work of TRAMPLIN. Therefore, the development and production of new, nontraditional types of raw materials and new technologies may become one of the most effective and quickest means of increasing the quality of consumer goods. TRAMPLIN is ready to make its contribution to the accomplishment of this task.

From the editorial office: The figurative meaning of the word "tramplin" [springboard] is the starting point of some activity. TRAMPLIN has already crossed the line, beyond which is the start of radical changes in light industry of the republic. We have been waiting a long time for them. There are, as we see, also specialists who are willing to undertake the settlement of the technical aspect of the matter, they are already acting. It remains to wish them success and to give their address: 277612 Kishinev, Prospekt Lenina, 220, the Vizir Scientific and Technical Cooperative, the TRAMPLIN Technical Board, phone number: 62-39-86.

7807

Problems of Organizing Work at Biogen Complex

18140230 Moscow MOSKOVSKAYA PRAVDA in Russian 24 Dec 87 p 2

[Article by F. Danilovskiy under the rubric "Science and Technical Progress:" "Medicine for Biogen"]

[Text] The Biogen Interbranch Scientific Technical Complex (MNTK) has been operating more than a year. The development of new microbiological preparations, which are extremely necessary for agriculture and medicine, and the quick assimilation of their production are envisaged by its program. The complex should become a catalyst of ideas which speed up the introduction of innovations in practice. The interbranch scientific technical complex has all opportunities for this. For 22 different organizations, among which are leading institutes and enterprises, are participating in the program. The Institute of Bioorganic Chemistry (IBKh) of the USSR Academy of Sciences has been named the center of business cooperation of scientists and production workers.

Sufficient time has already passed since the day of the founding of the complex to pose the question: Does the interbranch scientific technical complex justify the hopes placed in it? To what extent is it stimulating the output of the microbiological products needed by our country?

Successes? They exist. Evidence of that is if only the development within the Biogen Complex of the unique medicinal preparation interferon alpha two. It will aid the treatment of various viral diseases. Now the preparation is undergoing clinical tests, their first results show that it is especially effective in the treatment of such a serious illness as hepatitis B.

It is also possible to add that the production of more than 120 different items, among which are unique preparations, chemical reagents, and scientific instruments, is being planned in many respects owing to the interbranch scientific technical complex. Field crop growers and physicians are waiting impatiently for the products of the Biogen Complex.

"New steps are justly expected from the interbranch scientific technical complex," Corresponding Member of the USSR Academy of Sciences V. Ivanov, deputy director of the Institute of Bioorganic Chemistry, relates. "By means of the biotechnology of plants it is possible to breed highly productive strains of agricultural crops and sterile seed, which significantly increases their yield, while genetic engineering will help to develop highly effective medicinal preparations. But it must be admitted: the results, which we have today, are far from the desired ones."

What is hindering the Biogen Complex in the implementation of its plans? The first and main reason is departmental isolation. Indeed, however strange, precisely the isolation of sectors is hindering the interbranch association.

For example, scientists have great claims against their colleagues, the chemists. Special chemical reagents are necessary for the output of new preparations. But the USSR Ministry of the Chemical Industry is treating the production of such reagents as a secondary matter. It is profitable for chemists to produce fewer descriptions of products, but in large volumes. The production of meager amounts of reagents is a troublesome matter. The situation with laboratory equipment is also the same. It has reached the point of absurdity: plastic laboratory dishes are being bought for currency. Within the Biogen Complex the production of the necessary equipment and instruments should be assimilated.

The interrelations of the Biogen Complex with the ministry, which should precisely be concerned that you and I get sick much less often, are also not forming easily. It is a question of the USSR Ministry of Health.

"It is in no hurry to introduce our preparations, which were developed with the aid of genetic engineering," P. Reshetov, scientific secretary of the Institute of Bioorganic Chemistry of the USSR Academy of Sciences, says. "At times this process drags on for 12-15 years. One of the reasons is the lack of a unified system of clinical tests of preparations. Moreover, the workers of the ministry at times are simply not interested in introduction. It is easier for them to buy a similar foreign preparation than to give the go-ahead for a domestic one. True, a new system of the checking of medicines, which will speed up their tests by two- to threefold, is being introduced."

Is this speed up affecting the Biogen Complex?

"For the present we do not yet see real changes in the system of the conducting of tests of preparations that were developed within the interbranch scientific technical complex," B. Kaloshin, chief specialist of the USSR State Committee for Science and Technology, relates. "The maximum time of such tests should be not more than 2 years. Otherwise all the efforts of the Biogen Complex on the quickest introduction of new preparations in medical practical come to nothing."

The overall lack of coordination is also affecting the financing of work of the interbranch scientific technical complex.

"Now the role of stepdaughter among sectorial sisters is in store for the complex," V. Yanchin, chief specialist of the Ministry of the Medical and Microbiological Industry, says. "Without having legal rights, without possessing real administrative power and a system of financing, it cannot hold one strictly accountable for the fulfillment of its assignments, it does not have the opportunity to stimulate the introduction of scientific developments. This is creating a cool attitude of some production workers toward the assignments of the Biogen Complex. Unfortunately, the principle: 'One pulls one way and the other pulls the other way' has become established in its financing. One or another sector will allocate assets to an enterprise, which is participating in the work of the complex, it will fulfill the assignments of the interbranch scientific technical complex, it will not allocate them.... Here, as they say, 'you will not get anything.' Therefore, a portion of the potential energy of the Biogen Complex is being spent on endless consultations, approvals, inquiries...."

They also agreed with this opinion at the academic institute. Here is what P. Reshetov, scientific secretary of the Institute of Bioorganic Chemistry of the USSR Academy of Sciences, believes:

"A wave of reports has swept over us. It is necessary to provide hundreds of references to superior organizations. Moreover, many points in them are repeated. We have literally been bombarded with financial instructions, which completely repudiate the economic independence of the complex."

Is there a medicine which is capable of curing the Biogen Complex of the paper fever? There very likely is. This is the quickest changeover of enterprises and institutes of various sectors to self-financing and self-support [samookupayemost]. Cost accounting should become the vaccine which will reliably protect the creative research of scientists against formalism and bureaucracy. Incidentally, a grain of skepticism is also felt in the position of scientists: Will the interbranch scientific technical complex obtain financial independence under the new conditions of economic management?

There are grounds for the skepticism. Here, for example, specialists reckoned that on the basis of the Biogen Complex it would be possible to prepare excellent seed for flowers. Their production in Moscow area hothouses would increase by several fold. There is also a direct advantage for the interbranch scientific technical complex. The Moscow City Soviet took an interest in the possibility of buying flowers from the Biogen Complex, but financial organs...prohibited their sale. Or another example. In the parks and on the streets of the capital it would be possible to grow a hybrid of poplar and aspen, which was developed by scientists. The Ministry of the Timber, Pulp and Paper, and Wood Processing Industry would buy such hybrids with satisfaction from the interbranch scientific technical complex. But financial organs are not permitting them to be sold, citing longstanding instructions. Will the new statutes on the economic independence of enterprises perhaps get this matter moving?

Little time remains to the changeover of scientific organizations to cost accounting. Undoubtedly, the new conditions, under which many scientific collectives will be placed, promises the interbranch scientific technical complex new opportunities, but will also create a large number of problems. And, therefore, the interbranch scientific technical complex requires attention precisely now. A new approach to the organization of work is necessary precisely now. For the present it is in many respects formal and, hence, does not make it possible to use the possibilities which are incorporated in the idea of the interbranch scientific technical complex.

7807

Tekhnikum Training Criticized by Graduates, Students, Officials

18140059 Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Sep 87 p 2

[Series of comments published by Department of Science and Technical Progress of SOTSIALISTICHESKAYA INDUSTRIYAin the column "The Technician and Acceleration": "There Are 19,000,000 Million of us"; last paragraph is editorial roundup]

[Text] **G. Minin:** A single complex could be formed from a VUZ and a tekhnikum with successive mutually supplementing programs of instruction.

V. Kozlov: The army does not try to use tekhnikum graduates according to their specialties. It obliges them to retrain, after which they do not return to us.

M. Manova: It is not right when a future electrician is forced to work as a bookkeeper in practical training, as was my case.

B. Antropov: Before speaking of a decline in the prestige of the technician, it is necessary to pinpoint what position in production or at a scientific-research institute he can aspire to.

N. Shlyakhov: In sectors, tekhnikums can serve perfectly as centers for training and upgrading qualifications of middle-level specialists.

V. Baydenko: One of the acutest problems of tekhnikums is teachers. How to attract talented teachers and get rid of casual people?

N. Prilipkin: A komsomol member is duty bound not to be a passive recipient of knowledge but to prepare himself for problems which await him in production.

A. VYALKIN, senior tekhnician at the All-Union Avtogenmash Scientific-Research Institute:

I graduated this year from Moscow Machine-Building Tekhnikum. When I came to work at the All-Union Avtogenmash Scientific-Research Institute, I was offered the position of a laboratory worker with a salary of 90 rubles a month. You will agree that the question would arise in any individual: was it worth the while studying for 4 years and trying to get a diploma cum laude? I had to put up a fight for them to entrust me with design work.

It is not just a case of low salaries for graduates. On entering the tekhnikum, we thought: although it is not a VUZ, at least we can obtain a secondary education and a technical specialty. But as the time drew closer to a diploma, many began to think: but what will we be? Workers? Brigade workers? Foremen? The subjects that we studied did not provide an answer to this question. And today many of my classmates complain that they lack the the ability to work with people. And I myself feel that the drafting course which I took at the tekhnikum is manifestly poor for the work of a designer. So you start to doubt: has not our vocation become obsolete, is there a place for it in the world of the present-day technician?...

Young specialists after a tekhnikum acquire only a third or fourth category. They cannot compete with workers and more readily go after engineering positions. But here too there is a problem—their knowledge is inadequate. The time has come to clearly determine the place and functions of a technician in production. So far he has been unable to have his own lawful place—the problems will remain.

V. SHIPUNOV, collegium member of the USSR Ministry of Higher and Secondary Specialized Education:

The party and the government pay a great deal of attention to school reform. Important decrees have been enacted on restructuring higher education. The time has come to seriously deal with the "intermediate" level—secondary specialized educational institutions. The Soviet system of these educational institutions is unique in the world not only because of traditions and scale but because it solves a dual problem: it carries out the training of the largest mass category of specialists in terms of numbers and at the same time it provides its graduates with a general secondary education.

Today the secondary specialized school faces the problem of not so much expansion of the scale of training personnel but of the qualitative renewal of the contents and methods of instruction. It is necessary to have the profile of training specialists approximate as much as possible the requirements of practice.

A. KOBZEV, deputy ministry of the automotive industry:

In motor-vehicle building, almost 40 percent of the engineering, technical and supervisory positions are occupied by technicians. This is a tremendous force. And we believe that the technicians' role will grow. Everybody knows that the rate of technical progress is largely determined by the engineering base. It must include a kind of bloc where ideas are generated and the basic directions of their realization are worked out. Next you have a group of people who incorporate these ideas. This is a second group which in our opinion must be basically staffed with technicians. In other words, with people who can and do perform calculations, make drawings and with their own hands fabricate and assemble a new machine. Talented, trained technicians need to be used in the solution of such creative problems. With complication of production—and this is where it is going—the role of technicians will also increase in it. It seems to me that in distinction to engineers, they are closer to real life. In our case, for example, technicians work at those work stations where a great volume of knowledge is required. They service robotic complexes, machine tools with numerical control and flexible automatic systems.

This is a necessity dictated by the level of modern equipment. It is time to reject the obsolete view that a specialist with a diploma must be at least a minor, but without fail, a chief....

G. YAKIMOVICH, chief of a department of the USSR State Committee for Labor and Social Problems:

Today about one-third of a million persons with a secondary specialized education work in fields far from the vocation they obtained. This is an alarming symptom forcing us to think that all is not well with us in the use of tekhnikum graduates. Apparently, it is necessary to bolster the goal-oriented training of specialists on the basis of orders of enterprises. Such a form of interrelationships already exists, but so far it is in an embryonic state.

On the other hand, 40 percent of our engineering positions are occupied by persons with a secondary education. Such a situation did not come about because of good living. In order to retain a good technician, it was found necessary to appoint him to an engineering position. Now with the transition to the new system of management, the enterprise director will determine himself who suits him better. And all pay difficulties in positions will have to be eliminated. These measures will serve to bolster prestige.

Among the outlined changes in the wage system of engineering and technical personnel, for technicians in particular the first and second category are being introduced. Now their minimum salary will be equal to 110 rubles and the maximum to 160. Heads of enterprises will be able to establish pay increases of up to 50 percent of salary. We still have to determine more precisely in what worker and engineering positions it will be possible to use specialists with a secondary technical education.

A. SHCHELOKOV, a student at Podolsk Industrial Tekhnikum:

At many tekhnikums, so much obsolete equipment is to be found in many manual-training workships that it practically makes no sense to master it—enterprises are equipped with much more modern machine tools and production units. The question arises: why can't they share this equipment with tekhnikums?

Someone might say to me that production itself is experiencing a shortage of good machines tools without which you cannot make good products. Then let us manufacture them rather than engage in making training objects. Work can be so organized that we would work at modern equipment directly in the shops of an enterprise. And at the same time acquaint ourselves with its life and problems. Both the enterprise and the tekhnikum would gain. Without this, the result is that in the training process we become backward.

I would bring up the question not only of production output. Our diplomas should be defended not for pro forma's sake but rather by taking on some bottlenck in production and trying to eliminate it. For the introduction of such diploma work, a tekhnikum could get part of the economic effect. And it would install discipline in the young people and oblige them to approach a problem more responsibly.

N. DROZDOV, deputy minister of ferrous metallurgy:

I am grateful to fate for having started my way to my specialty from a tekhnikum. The knowledge and skills obtained there have served me all my life as an invaluable aid in work. I remember that many wanted to become foremen immediately on completing a tekhnikum, but we were assigned to work as brigade workers. We felt hurt. But later we understood how right our first teachers were. The fact is that after completing a tekhnikum a person still does not have sufficient practical know-how nor the ability to work with people. On appointing such a person as a foreman, he would fail ignominiously. And there is no way of knowing how his life would shape up after such a failure. In working as brigade workers, we acquired the necessary experience. And the knowledge obtained at the tekhnikum did me a service even at the time of study at a VUZ: in the first courses, I passed many subjects without particular effort, almost without preparation.

In my opinion, every future specialist must go through a tekhnikum. After this, at the VUZ and in production, he will be a welcome guest. Approximately 300,000 technicians work in ferrous metallurgy. Half of them are in supervisory positions and the other half at work stations. And I see nothing bad in this. Among tekhnikum graduates, most highly skilled workers are to be found. I am certain that the more complex equipment and outfitting of production becomes, the greater will the demand be for using graduates of secondary specialized institutions.

L. SHVETSOVA, secretary at the Komsomol Central Committee:

Almost all enterprise managers agree on the fact that tekhnikum graduates lack the know-how for organizational work and the ability to supervise people. But what can they do if we decide everything for them from the time they are students? It is no accident that at the 20th Komsomol Congress, one of the chief questions was that of development of self-management and participation of students in the affairs of their collective.

Today we are concerned with the state of affairs of komsomol organizations of educational institutions. At tekhnikums and at VUZ's nobody for all practical purposes listens to the opinion of the young people. At best, they solve some questions of minor importance. Yet it would be nothing bad if young people were consulted how best to compile a schedule or organize the teaching process. At the congress, they said that students should

take part in summarizing results and in evaluating the work of their comrades and even of teachers. And even now a document has been adopted permitting students, true, so far only of VUZ's, to express their opinion in anonymous form concerning how a teacher provides instruction. In development of self-management and democratization of the life of educational institutions, we see that factor that would make it possible to increase the activeness of future leaders of industry and develop in them organizational qualities and the ability to defend their own opinion. In a word, they will be a lot better prepared for practical life.... We must always remember that the specialist can be taken in many ways. And his becoming depends on the sum of the components.

S. KOROBOV, director of tekhnikum for building radio apparatus:

Many people believe without any basis that the specialty of technician is a dead end. Right after completing his studies, he usually receives 100-120 rubles a month. But hardly anyone will agree to spend all his life for such pay. There is but one choice: either to try to get into a VUZ so as to go on studying or become a worker. For a person to bear the title of technician with dignity, he basically needs not only to boost his earnings but to clearly determine what his prospects are.

Meanwhile we constantly run into facts to the fact that our graduates are being used in unskilled positions. It is necessary right now to think of ways of solving this. Otherwise we could find ourseslves facing a problem where tekhnikum graduates are not needed by anyone.

N. GALAKTIONOV, director of Moscow Carburetor Plant:

From the speech of the chairman of the USSR State Committee for Labor and Social Problems, one might get the impression that the problem of technician's pay has been resolved. This is not quite so. Categories and pay increases have been introduced, but they have been once more enmeshed in all sorts of instructions which do not permit paying people for their contributions. I believe that it is necessary in general to remove all restrictions in this matter. Why must I pay less to a knowledgeable technician than to a so-so engineer?

We recently conducted sociological studies. They showed that foremen with a higher education are satisfied today with their salaries but not with the character of the work. They think that they could do something bigger and usually try to go to a scientific-research institute or to a design bureau. Yet specialists with a secondary technical education working in engineering positions as a rule are satisfied both with the character of the work and the salary. For this reason we have to gamble on technicians. I have a registry of all specialists with a secondary technical education. I rely on it.

Heads of enterprises who share this viewpoint are deeply interested in upgrading the level of technicians' training. It is apparently now necessary to carry out certification of actual secondary education institutions. The time has come to answer the question without embellishment: who trains what specialists where? Unnecessary tekhnikums need to be eliminated, some to merge and others to be bolstered. The time has come to proceed to more flexible forms of organization of specialists' training.

As we see, the participants of the round table are unanimous in that many unresolved questions are to be found both in the use of graduates of secondary specialized educational institutions and in the system of their training. This also applies both to the technician's job in production, and remuneration of his labor, and restructuring of the operation of tekhnikums, and equipping them with modern technical equipment, and recruitment of qualified pedagogic personnel, development of self-management and much else. Consequently the editorial office plans to continue the discussion under the heading "Technician and Acceleration." We invite the participation of students, tekhnikum graduates and teachers, heads of enterprises and departments, scientists and representatives of the public. Your responses and proposals will help select the most rational ways of solving the propounded questions.

Department of Science and Technical Progress of SOTSIALISTICHESKAYA INDUSTRIYA.

7697

Industry Now Contracts on Paid Basis for Training of Specialists

18140248 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 6, 1988pp 6-7

[Interview of Anatoliy Georgiyevich Porshnev, rector of Moscow Institute of Management imeni S. Ordzhonikidze, by S. Abramov: "Specialist by Contract"; first two paragraphs are source introduction]

[Text] For our VUZ's, new relationships with industry, A. Porshnev, the rector of Moscow Institute of Management imeni S. Ordzhonikidze, states, been established with industry. In order to secure a required number of graduate specialists, the sectoral ministry to which the requesting enterprise is subordinated concludes a contract with the USSR State Committee for Education. And only when the enterprise pays 3,000 rubles from its fund for development of science and technology for each engineer or economist applied for, will these come to its shops, departments or laboratories."

The full cost of training a specialist is, of course, much higher. It depends on the specialty and on the VUZ in which the student is studying and can vary from 6,000 to 15,000 rubles. In addition, the cost of higher education is

constantly growing. Sizes of students' stipends and salaries of instructors are being increased. Equipping laboratories with equipment and computers costs more. Such a process is characteristic not only of our country, but in our case a significant gap has been created between the present cost of education in higher school and the budgetary monetary assets being allotted for it. Additional revenues from sectors of the national economy will partially help solve this problem. Consequently, the quality of training specialists will be raised. Which is the objective of perestroika of higher school.

[Question] Anatoliy Georgiyevich, what effect will the innovation have on the prestige of engineering work?

[Answer] Only a positive one. The payment of enterprises for a graduate specialist must radically change the attitude of production people toward him. The fact is that up to now it has been easier for an enterprise to place an order for an engineer than to find a worker. It allocates annually quite sizable funds for the training of qualified workers and the creation of suitable social and living conditions for them. But the plant secures practically as many graduate specialists as indicated in the requisition, moreover, without spending a single kopeck for this. Management has displayed little concern in regard to the life of young specialists—all the same, they do not have the right to leave an enterprise for a period of 3 years. But even if someone after that period of work does leave, the vacancy can be easily filled by an order. As a result the engineer has depreciated in value. It is no accident that about half a million graduate specialists have been "requalified" into workers.

[Question] I remember even justifying this process, considering it a natural one. They say that present-day electronic equipment can be operated competently only by people with a higher education.

[Answer] No one argues that it is difficult to work with modern equipment without high qualifications. But the system of vocational training is engaged in training such personnel and it is not necessary to replace it.

Payment to higher school for graduate specialists should result in a more rational utilization of them in production and in more justified requisitions for them. We immediately felt this under the conditions of transition of a significant portion of enterprises and associations to the new conditions of work.

The closer contact of VUZ's with industry promotes the solution of the February (1988) Plenum of the CPSU Central Committee. According to it, in addition to the distribution plan, a kind of state order for specialists, educational institutions will distribute a portion of the graduates on the basis of direct contracts with enterprises.

Payment for the training of a graduate specialist also qualitatively changes the principle of enterprises sending workers and employees to institutes and universities. Now there is being added to the 3,000 rubles paid in the form of a stipend to its student the same amount for "buying him back" from higher school. And managers of plants and factories, especially under the conditions of cost accounting, will now think in advance whom and why to send for study.

[Question] There are enterprises that pay nothing for the training of specialists, for example, those operating at a loss. What will they do?

[Answer] I think that the ministry has to help those under its custody which find themselves in a difficult financial position. In the final analysis, personnel renewal and the influx of new forces are also a way of dealing with production unprofitability and low profitability. But basically of course, an enterprise has to take money out of its own pocket and put it in the pocket of the VUZ. More precisely, for the USSR State Committee for Education. And in my view, such a situation in which VUZ's really do not see money for professional work does not jibe with the principles of cost accounting.

I would like to point out the promising character of the changeover to cost accounting for the VUZ system of training and improvement of personnel's qualifications. We are also thinking of gradually changing over to such a relationship with industry. I would like to bring to mind that our institute is training and retraining about 1,000 persons a year at the faculty of organizers of industrial production and construction. Moreover, at special evening faculties, many Moscow people with a higher education acquire a second specialty without separation from production. Consequently transfer of the system of retraining to cost accounting will provide us with additional money for further improvement of teaching and research work and incentives of instructors. This will oblige managers of enterprises to select students more carefully, giving preference to those specialists whose retraining would bring a real benefit to production.

Thus our institute set itself the task of training the entire management apparatus of the enterprises of the Volgogradskiy Rayon of Moscow for work under the new conditions of management. But if our rayon consultation centers now help, for example, the Frezer, Stankoagregat and other plants free of charge, then it will make sense to think today of a new form of payments.

7697

Scientists Discuss Trends in Artificial Intelligence

18140178 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 22, 17 Nov-7 Dec 87 pp 4-5

[Article by NTR: PROBLEMY I RESHENIYA science commentator A. Lepikhov under the rubric "The Problem Close Up:" "Artificial Intelligence;" first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] This term was first suggested in 1956 by John McCarthy, an associate of Stanford University. Now it has become clear that it is not entirely apt, since it immediately gives rise to the notion that it is possible to create artificial intelligence in the literal sense of the word. In reality it is a matter not so much of the machine simulation of the processes of human thinking as of the development of models and the corresponding firmware (intelligent systems), which make it possible to solve with the aid of a computer problems and tasks of a noncomputational, intellectual nature, which require the use of messages, texts, and visual images. The problems of this research direction and information and computer technology in the country were thoroughly discussed recently at a meeting of the Presidium of the USSR Academy of Sciences. We are publishing a report of our special correspondent.

The Technical Challenge

To introduce the reader to the theme, let us begin with a few figures. In the past 5 years an essentially new sector of industry—the production of intellectual systems—has emerged in the West.[1] In the United States the investments in it 2 years ago came to $370 million. According to existing forecasts, in 5 years the world investments (excluding the USSR and the CEMA countries) will come to $19 billion. Of them the United States will account for $12 billion, Japan—$5 billion, and the countries of Western Europe—$2 billion. In other words, the increase of the financial investments in the United States alone in the next 5 years will come to 3,300 percent—an unprecedented phenomenon for any sector of the world economy. Today several tens of journals on the problems of artificial intelligence are being published in the world, in the past decade more than 300 monographs and about 600 collections, which are devoted to this problem, have appeared.

And nevertheless, despite the abundance of information, Professor G.S. Pospelov considered it necessary to begin his statement in the presidium with the present-day interpretation of the concept "artificial intelligence."

"Imagine," he said, "that I have written a very good program for a computer chess game. Is this a work in the area of artificial intelligence? In principle, yes, but in essence, no. For a computer, while playing chess and even beating masters, or else grand masters, does not do anything else. It, for example, cannot switch to playing checkers or 'naval battle,' although they are much easier. "If you wrote another good program and the computer began to write song melodies better than composer-'hacks,' this, although it seems like 'artificial intelligence' activity, in reality is only the usual work of a programmer.

"Starting in the late 1970's a new approach to the problems of artificial intelligence, the essence of which consists in the fact that it is necessary to program and implement on a computer not the solution of specific problems, however intellectual they are, but to attempt to develop within the computer aids which generate such programs automatically, appeared. Man does something similar, for his 'cleverness' consists not in the fact that he plays chess or drives a motor vehicle, but in the fact that each of us is capable of learning a new type of activity.

"Researchers in the field of artificial intelligence are working precisely on seeing to it that computers by means of the aids, which have been built into them, could write new programs in accordance with our verbal descriptions. I see precisely in this the revolution which awaits mankind in the area of artificial intelligence.

"Everyone, who will work with computers of the immediate future, will no longer need a knowledge of programming languages. By knowing how to use just a typewriter keyboard, a specialist will be able in the language of his science to ask the computer questions and to get answers in the same language."

"I believe," Academician G.S. Pospelov stressed, "that the rapid development in the area of the theory, designing, and development of intelligent systems is explained by the fact that the central means of developing all information and computer technology lies precisely here."

In support of his idea the academician recalled the words of French President F. Mitterrand: "Mankind has been confronted with a technical challenge, which it has not met throughout its history and which will require the reform of the entire social structure...."

"And, finally," Germogen Sergeyevich Pospelov continued, "apparently, not everyone knows that in the United States in support of the Strategic Defense Initiative a strategic computer initiative has also been announced. In contrast to the Strategic Defense Initiative, this is an entirely practicable and extremely serious matter."

Our Report

The strategic computer initiative (SKI) was formulated by the Office of Advanced Research of the U.S. Department of Defense in October 1983. About $600 million were released for 1985-1990 for its completion. If you take into account the financing of the work on computers within other Pentagon programs, last year alone the strategic computer initiative already used up about $300 million.

The tasks of the strategic computer initiative are grouped in three basic directions. These are the development of a self-contained mobile unit, which is capable of moving over rugged terrain, the development of an "assistant pilot" expert system, as well as a control system of military operations.

For the achievement of the goals, which have been set in each of the research programs, it is proposed to have six types of systems, namely: expert (by which there are understood information systems, in which the knowledge of leading professionals in one field or another is concentrated in the form of machine-readable programs), communications in natural language, visual observation, navigation, the recognition of voice commands, and the simulation and planning of production processes and combat operations.

It is extremely important that in this case not only traditional information on formal methods of the representation of knowledge, but also data, which are a result of the abundant personal experience of a leading specialist, are incorporated in the computer.

How Are We Responding?

"In our country," G.S. Pospelov continued, "only the theoretical directions have been developed well. Here we are in many respects leading our foreign colleagues.

"Today in this area two approaches have become firmly established: the bionic approach, the supporters of which believe that it is actually possible to develop artificial intelligence in the immediate future. And the second approach—I would call it the pragmatic approach—in which the concept 'artificial intelligence' is of a purely metaphorical nature. And real results have been obtained precisely here. What has already been done?

"First of all, the method of situational control, which led by decades analogous work in the West, was developed. The theory of logical linguistic models—the foundation for the development of the theory of knowledge bases and the designing of expert systems—is well developed. A set of so-called pseudophysical logics—of time, space, and action—which make it possible to carry out in knowledge bases all the operations on their replenishment, has also been developed. In the West similar work thus far lags behind the level that has been achieved by our scientists.

"Owing to domestic research in the field of computer logic, the first automatic systems of proofs of theorems in the world and an original 'seek-output' method appeared, while what is called the 'Maslov inverse method' has been included in all the corresponding textbooks, including foreign textbooks.

"As to applied work, it is being developed in several directions. First of all there are those, which simulate, model creative processes. Then there are question-answer systems, which make it possible to access the computer in what is called a 'limited natural language.' Another direction is computational logic systems. By means of them the nonprofessional programmer can solve problems of any difficulty without intermediaries.

"And, finally, in recent times artificial intelligence 'has begun to play' in expert systems, which are intended mainly for poorly formalized or entirely mathematically unformalized areas. Among them are diagnostic systems in medicine or technology; monitoring systems, which make it possible on a real time scale to follow, say, the operation of nuclear reactors or to monitor patients during resuscitation; planning expert systems, which are close in their ideas to systems of the optimum distribution of resources. Finally, there are also expert systems for instruction.

"Now, by the way, we are developing jointly with industry the Granit System. It will make it possible to decrease the time which is spent on the process of general industrial planning from a year to a month or even 2 weeks. It is also impossible not to speak about the Mavr Designing System, which makes it possible to solve designing problems without the intervention of mathematicians and programmers.

"As a whole it must be admitted that we obviously have insufficient applied work of such a level. One of the reasons is the lack in the country of the appropriate specialists."

Our Report

According to the data of the World Council for Artificial Intelligence, in all countries there are approximately 5,000 active specialists who are working in this field (an active specialist is one who has not less than five publications). In the United States there are approximately 3,500 of them, in the USSR there are a little more than 200.

What else is hindering domestic applied work on artificial intelligence?

Corresponding Member of the Estonian SSR Academy of Sciences E.Kh. Tyugu:

"We can hardly conduct experiments ourselves, more precisely, there is nothing to conduct them on.

"True, what has been said does not apply to our group, which is working under quite good conditions. But the whole point is that we are a part of the Start Collective. The participants in the project of developing a supercomputer of a new generation to start with received quite

good tools, then the Start Collective developed the new Kronos 32-bit processor and workstations. But I doubt that we could have quickly set up their production for everyone wanting them."

Our Report

Research in the field of artificial intelligence requires powerful computational aids like workstations. This is a combination of several elements, namely: a 32-bit microprocessor and a "memory," which now in Western computers is built on the basis of a 1-megabit chip. It is also impossible to do without the corresponding displays, since the visual image is an essential part of such a work station. And, finally, an internal storage in the form of a Winchester disk, with a capacity of 200-300 megabytes is needed. Our industry does not produce these elements of workstations.

Moreover, if we talk about the mass production of both personal computers and workstations, it is also impossible to do without automated equipment for the production of computers. It is also not produced in our country.

Candidate of Physical Mathematical Sciences A.S. Narinyani:

"Unfortunately, now the development of programs is being carried out in the country, let us state frankly, by semiprimitive methods, industrial methods are needed! The present concept of a program factory presumes that it would be possible to develop systems, which are intended for the end user, not in years, but tens of fold faster.

"Prototypes of such factories are already operating within the framework on the Start Collective. We have succeeded in finding new methods at the intersection of artificial intelligence and applied programming. They enable the user and the developer to deal not with programs, but with a model. Up to now this was impossible.

"And a second thing. At the level of the maintenance of individual laboratories and purchases of equipment we will not save the situation and will not accomplish the tasks, which determine the future of computer technology. A powerful main organization, which has the appropriate resources and a practicable comprehensive program, is needed. All its coperformers must work toward the end result. It seems to me that this would be the most correct mode of action."

Candidate of Physical Mathematical Sciences V.F. Khoroshevskiy:

"If we do not make a qualitative leap in order to catch up with foreign researchers in the field of the technology of developing intellectual systems, equipment, and programs, our theoretical reserve, which at present exists and is very representative, may 'evaporate.'

"I would like to cite a sad example. At the Computer Center of the USSR Academy of Sciences a new term 'collective-use personal computer' has appeared. This means that from 9 am to 12 am the time on such a computer is distributed among users. For comparison: at IBM there are 20 percent more personal computers than there are staff members, while seven large computers are united into a network and are the common storage of the corresponding knowledge.

"Thus, our collectives, which at present are still at the world level, are acting, in reality, in a resourceful manner. They need significant state support."

What Is To Be Done?

First of all, those who spoke in the presidium believe, it is necessary to restore the teaching of computer linguistics, which previously was organized well at a number of leading universities. It seems, however, that the Ministry of Higher and Secondary Specialized Education of the country does not realize the importance of the problem. It, for example, so far has not reacted to the decision of the Information Science, Computer Technology, and Automation Department of the USSR Academy of Sciences on the necessity of this step. Let us note in passing that Academician G.S. Pospelov personally presented the text of the decision of the department to Minister G.A. Yagodin.

It is necessary, and most quickly, to train "knowledge engineers." These are people, who, on the one hand, have a professional understanding of some subject area and, on the other, know artificial intelligence engineering and can use modern computers.

And, of course, in the unanimous opinion of those who spoke, a main organization, which is the coordinator of all work on artificial intelligence in the country, is needed.

I would conclude the report on such a practical note, if it were not for recollections nearly 7 years old and the documents, of which many of those, who attended the present meeting of the Presidium of the USSR Academy of Sciences, were the authors.

At that time, just as now, it was noted that in our country only small groups are dealing with the problem of artificial intelligence. It was stated that a state interdepartmental goal program is necessary for the surmounting of the increasing lag of the USSR behind the world level and for the coordination of our efforts in this field.

The development of a generation of computers, in the structure and functioning of which it is necessary to use the achievements of artificial intelligence (the planning of computations according to a text description of the

problem, a dialog with the user in a natural language, the presence of a knowledge bank in the computer, the voice and visual input and output of information), should be its goal.

Another of the elements of such a program is the development of self-contained systems which are capable of independent movement in an unfamiliar area. They, for example, may be needed already in the very next few years in case of the landing of automatic research stations on Mars.

The development of systems, which make it possible to describe, classify, and forecast the development of complex situations on the basis of incomplete, unreliable, or indirect information, has also been planned.

At the same time, then, in 1980, it was emphasized: the work on artificial intelligence "will get hung up," if it is not a subprogram, a part of the national efforts on the development and use of computer technology in all areas of the national economy.

Foreseeing the trends of the development of computer technology, which had already appeared at that time, it was proposed to open divisions of artificial intelligence at all scientific research institutes and design bureaus, which were developing computer technology, and to man them with capable programmers, linguists, and logicians. It was envisaged that these specialists would undergo advanced training and would acquire vast mathematical knowledge.

The question of the main organization in the area of artificial intelligence—the establishment of a special research center or the reorientation for the solution of these problems of one of the existing academic institutes—was also not avoided.

Back in 1980 the question of the training of specialists was urgent. By that time—for 5 years—they were being trained at 20 universities of the United States and the 6 largest universities of Japan. The training of researchers in the field of artificial intelligence had been started in the FRG, Italy, and France.

At that time the question of publications was also just as sore. In the United States six specialized journals, which are devoted to the problems of artificial intelligence, were already being published 7 years ago, in Japan three were, the corresponding journals were appearing in the FRG, France and China. Today we also do not have one similar publication.

Thus, at the close of 1987 those who had gathered in the headquarters of Soviet science in practice spoke about the very same problems and about the very same unaccomplished tasks.

But today a fundamentally different situation than 7 years ago has formed. In December 1985 the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries was adopted. The task of developing a supercomputer of a new generation with a speed of more than 1 billion operations a second...on the basis of the principles of artificial intelligence is posed by the first paragraph of one of the priority directions in it.

I would like to believe that the work being planned today in the area of artificial intelligence will not dissolve in the ocean of countless departmental consultations, will not get bogged down in red tape, and will not come up against the stubborn reluctance of our industry to assimilate the achievements of basic science with the speed which the age of restructuring requires.

Footnote

1. For more detail on intellect systems see NTR, No 23, 1986.

7807

UDC 621.9.06-52

Automatic Rotary, Rotary Conveyor Lines

18140247b Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 1, Jan 88 pp 1-3

[Article by Candidate of Economic Sciences G.I. Kalitich, deputy director of the Ukrainian Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research, and engineer V.S. Strokan: "An Important Direction of the Acceleration of Scientific and Technical Progress"]

[Text] The accomplishment of the tasks of the integrated automation of production, which ensures the significant increase of labor productivity, the increase of the output of products, the improvement of their quality, and the decrease of the production cost, is envisaged by the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000.

The use of flexible production systems is most effective for the automation of custom and small-series production, while the use of automatic rotary complexes based on automatic rotary lines (ARL's) and automatic rotary conveyor lines (ARKL's) is most effective for the automation of large-series and mass production for the output of items of simple geometric form and small size.

In May 1986 the Politburo of the CPSU Central Committee examined the questions that are connected with speeding up the introduction of automatic rotary lines and automatic rotary conveyor lines in the national economy. It was noted that the organization of the mass production of equipment of new generations, and particularly rotary lines, which ensure a manifold increase

of labor productivity and the improvement of product quality quality, is a task of particular importance. All the leading machine building ministries have been enlisted in the development of lines.

The idea of developing rotary lines emerged for the first time in our country back during the years of the Great Patriotic War. They found application in the USSR national economy in the 1960's, when the task of the automation of production as one of the basic means of accelerating scientific and technical progress was posed. About 3,000 automatic rotary lines and automatic rotary conveyor lines of different types, each of which performs from 2 to 12 technological operations of a different nature with a speed of 120-1,200 parts a minute, are presently operating in the country.

In machine building the following operations are performed on automatic rotary lines and automatic rotary conveyor lines: cold and hot stamping; the molding of metallic powders; turning (the production of parts like shafts); investment casting, die casting, and permanent-mold casting; heat treatment (annealing, hardening, drying, and others) and chemical treatment (pickling, degreasing, phosphating, and others); the application of coatings (varnishing, painting, electroplating, stenciling, and others); the checking of the linear dimensions and form of items.

The scientific research being conducted in the country in the corresponding directions of the theory of technological machines of the rotary type is contributing to a significant degree to the extensive dissemination of the lines. Technical solutions at the level of inventions are the result of many developments. The largest number of developments at the level of inventions have been made at the design bureau of the Rotor Interbranch Scientific Technical Complex, Tula Polytechnical Institute, the Tula Proyektin Planning, Design, and Technological Institute, the Scientific Research and Experimental Institute of Automobile and Tractor Electrical Equipment and Automobile Instruments, and the former Zhdanov Affiliate of the Special Planning and Design Bureau of the Medical Industry.

The study of the experience of designing automatic rotary machining lines at organizations of the Ministry of the Machine Tool and Tool Building Industry and other ministries showed that it is possible to use rotary lines both autonomously for the performance of the entire machining cycle and within integrated lines or in systems of automatic lines for the purpose of performing a specific set of operations.

Being an important component of means of production, rotary lines in addition to ensuring a radical change of the content and methods of labor predetermine the corresponding level of production management. Thus, the assumption of K. Marx that economic ages differ not by what is produced, but by how it is produced, by what means of labor, is confirmed.

At present the designs of completely automated works, which are equipped with computerized control management systems, are being developed. The technical potentials and economic indicators of automatic rotary lines and automatic rotary conveyor lines can be fully realized only in case of the integrated automation of production, which ensures the automation of not only technological processes, but also the majority of auxiliary operations, as well as production management. Thus, the establishment of completely automated works makes it possible to reduce intershop and intrashop traffic to one-tenth to one-fifth, to increase the output of equipment by four- to sixfold, to decrease the labor intensity of items to one-fourth to one-third, to reduce the production area to one-third to ten twenty-sevenths, and to shorten the production cycle of the manufacture of items to one-twentieth to one-tenth.

The strict kinematic connection of the technological and transportation rotors in automatic rotary lines and automatic rotary conveyor lines ensures the consistency and uniformity of the handling of the flow of items and the controllability of technological processes. This significantly simplifies production management and makes it possible to reduce substantially the number of auxiliary service personnel and to shorten the unproductive idle times of equipment.

Brigade attendance with the use of the necessary means of office mechanization and on-line control is the most advanced form of the organization of labor in completely automated production based on automatic rotary lines and automatic rotary conveyor lines. Thus, automated production is inherently linked with the most advanced form of the organization of labor—the brigade form.

The high reliability of the operation of automatic rotary lines and automatic rotary conveyor lines, the regulated nature, continuity, and controllability of the technological process of machining items, as well as brigade forms of attendance predetermine the real possibility of the operation of completely automated works in accordance with unmanned technology.

It is possible to include completely automated works based on multirange automatic rotary lines and automatic rotary conveyor lines within flexible production systems. In this case it is necessary to ensure the shift from the machining of one item to the machining of another without the halting or with the minimum halting of the line, as well as the high fail safety of equipment and the possibility of automatic self-recovery without human intervention.

The intensification of the work on production automation on the basis of automatic rotary lines and automatic rotary conveyor lines is the main direction of the decrease of expenditures and the increase of product quality, which is assuming particular importance under the conditions of the changeover of enterprises to full cost accounting and self-financing. At the conference in

the CPSU Central Committee on 14 November 1986, at which the questions of introducing state acceptance at associations and enterprises of industrial ministries were discussed, the importance of introducing automatic rotary lines and automatic rotary conveyor lines for the assurance of stable product quality was specially emphasized.

The Rotor Interbranch Scientific Technical Complex was established for the purpose of the quickest introduction of automatic rotary lines and automatic rotary conveyor lines in various sectors of the national economy, and first of all in precision machine building, instrument making, and the food industry. The singling out of the main scientific research and design organizations, which under the supervision of the leading design bureau will develop automatic lines for their own sectors and will study the demand for them, is envisaged. The range of such lines has been broken down among machine building ministries. During the 12th Five-Year Plan the production of 8,450 rotary and rotary conveyor lines is planned in the country.

Much attention is being devoted to the training of specialists in machines of the rotary type. It is planned starting in 1988 to train not less than 200 engineers and technicians in the designing and production of lines and not less than 700 in their adjustment, maintenance, and repair. Much construction is planned for the purpose of providing an educational methods and pilot production base.

In the Ukrainian SSR about 400 automatic rotary lines and automatic rotary conveyor lines are presently in operation. Their share in the total number of automatic lines, which are being used in the national economy of the republic, comes to about 6 percent, moreover, automatic rotary lines and automatic rotary conveyor lines are being used primarily in the sphere of machine building and metal working.

Despite the fact that the effectiveness of the introduction of rotary complexes in large-series and mass production has been demonstrated, for the present inadequate attention is being devoted in the republic to their development and introduction. In this connection the study of the organizational, economic, social, and technical questions, which are connected with the introduction of automatic rotary lines and automatic rotary conveyor lines at all stages of the scientific and technical cycle (science—technology—production—use), and the issuing of management decisions on this problem on the basis of the development of summary, analytical, and synthetic models of information variants are an important task of the information services of the republic at all levels.

The establishment of the corresponding pavilion at the Exhibition of National Economic Achievements of the Ukrainian SSR and the organization of schools of advanced know-how for all specialists in rotary machines seem advisable.

The need has arisen for the establishment of chairs, which are similar to the one at the Moscow Higher Technical School imeni N.E. Bauman, at the majority of technical higher educational institutions of the republic.

At present the optimum choice of the objects of integrated automation with the use of automatic rotary lines and automatic rotary conveyor lines, in order to ensure the great efficiency of their use, is one of the urgent tasks, on the accomplishment of which specialists of various sectors are working. The soundness and optimality of the decisions made here are of fundamental importance, since they serve as the basis of long-term comprehensive programs and five-year plans of the modernization and retooling of enterprises and associations.

The development and extensive introduction of rotary complexes are contributing to the successful accomplishment of the radical restructuring of the production potential of the country.

7807

Major Effort to Collect and Classify Foreign Quality Standards

18140249a Moscow NTR: PROBLEMY I RESHENIYA in Russian No 1, Jan 88 p 2

[Article by V. Sizov, chief of the Department for Analysis of International and Foreign Standards of the All-Union Scientific-Research Institute of Technical Information, Classification and Coding of USSR Gosstandart: "The Seprosev System"]

[Text] **The System of Quality Evaluation and Certification of Mutually Supplied Products (the Seprosev System), created on the basis of a decision of the CEMA Executive Committee, goes into effect on 1 January 1988.**

In our country, the impetus for work in this direction has been the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 May 1986 "On Measures for Radically Raising Product Quality." Ministries and departments that serve as heads for types of products were assigned the task of creating in the years immediately ahead centers for certification of products for conformity to international standards. This task is connected to the development of foreign economic ties of production associations and enterprises. For this reason, Soviet specialists need to know well in addition to general organizational and methodological documents of international certification systems the requirements imposed on CEMA standards, standards and recommendations of international organizations for standardization and national standards of foreign states.

All the necessary information exists at the All-Union Scientific-Research Institute of Technical Information, Classification and Coding (VNIIKI) and also at central

sectoral organs for scientific and technical information and central scientific and technical libraries. However, the chief holder is the All-Union Scientific-Research Institute of Technical Information, Classification and Coding where the only file of its kind of foreign normative and technical documentation, translations of international and national (state) standards and standards of foreign unions, societies and associations is concentrated. They include the standards of CEMA, the International Standardization Organization (ISO) and the International Electrical Engineering Commission (MEK).

Approximately 45,000 translations of standards are stored at the All-Union Scientific Research Institute of Technical Information, Classification and Coding. These namely are the ones that the handbook "Perevody inostrannykh standartov" [Translations of Foreign Standards] specifically reports. For the information of specialists on the receipt of standards, the guide "Novyye inostrannyye standarty" [New Foreign Standards] and the information guides "Inostrannyye standarty" [Foreign Standards] and "Mezhdunarodnyye standarty" [International Standards] are published. The holdings contain a total of 280,689 titles of documents.

Indicators found in foreign standards specify quality level requirements that are presented on the world market.

By virtue of this, our specialists have particularly displayed an interest in the receipt of the standards of the International Standardization Organization series 9000 on quality systems. These are the International Standards of the International Standardization Organization 9001 "Quality Systems. Model for Ensuring Quality in Planning, Development, Production, Installation and Servicing"; International Standards of the International Standardization Organization 9002 "Quality Systems. Model for Ensuring Quality in Production and Installation"; International Standards of the International Standardization Organization 9003 "Quality Systems. Model for Ensuring Quality in the Process of Technical Control and Testing of Finished Products."

The start of publishing standards of the International Standardization Organization of this series was an important event for specialists. It was preceded by serious work at Technical Committee 176 where national and departmental, for example, military, normative technical documents as well as NATO publications on quality used in the United States, Great Britain, Australia and Canada were analyzed.

Access to the holdings of the All-Union Scientific-Research Institute of Technical Information, Classification and Coding is open to all enterprises, organizations and institutions where a need exists for familiarization and study of such documentation. Satisfication of requests is carried out through the institute's information center with the help of an automated scientific and technical information system which operates on a selective basis.

Address of the All-Union Scientific-Research Institute of Technical Information, Classification and Coding (VNIIKI): 103001 Moskva, Ulitsa Shchuseva, 4. Teletype 112311.

7697

Readers' Letters Urge Creation of Union of Inventors

18140247c Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 May 88 p 1

[Readers' letters: "How About a Union of Inventors?"]

[Text] The 500th issue of the journal IZOBRETATEL I RATSIONALIZATOR [Inventor and Rationalizer] has come out. It was founded in 1929. Albert Einstein wrote an article especially for the first issue. The number of copies of IR grew from 35 thousand to 436 thousand. In each issue much space was devoted to readers' letters. Each year about 16 thousand of them arrive at the editorial board. For the publication of this jubilee issue, attention is drawn to the collection of opinions of honored inventors of the RSFSR on a question which was also raised on the pages of SOTSIALISTICHESKAYA INDUSTRIYA—on the creation in the country of a Union of Inventors. Today we are printing the most interesting opinions.

V. Tikhomirov, dcotor of technical sciences, professor:

I have in mind that its members would first of all be honored inventors of the republics. In Moscow, Leningrad and in the majority of the union republics there is today already a significant number of potential members for the creation of regional organizations of the Union of Inventors of the USSR. Just as in the charters of the other creative organs, it is sufficient to have no less than 50 members of the union are needed for the creation of a local organization.

On the basis of the numerous suggestions from inventors, an initial group has prepared a draft of the Charter of the Union of Inventors of the USSR.

A. Orlov, honored inventor of the RSFSR, director of the All-Union Scientific Research, Draft and Design Institute of Glass Making Machines:

I think that a future Union of Inventors of the USSR would became an important, significant organization, just like the other creative unions. One reason for this is that everything which has been created around us, everything that we use, everything vitally necessary, surrounding us in any sphere, has all been made by the creative genious of the inventors. The inventor needs his own union, which would take care of him, help and protect him, aid in the creation of the most beneficial conditions for creativity. I think that inventors deserve this right to no less a degree than writers, artists or composors.

S. Kosarev, honored inventor of the RSFSR, chief designer of the All-Union Scientific Research Institute of the Knitwear Industry:

I went through all the stages of invention, and now nothing can surprise me. I was judged and cursed and I begged and was humiliated. Unique machines, so necessary for industry, had to be seen as one specimen, in the experimental section, and then in a heap of scrap metal. But foreign currency flows like a river to buy machines and technology from the West. We do not master our own, but buy from others. Not one manager, considering himself zealous, would allow such a thing. I need a Union of Inventors. I am sure that my colleagues do as well. The realization of inventions, intersector laboratories, material and other aid to the inventors, defense of their rights and worthiness—is this far from a complete list of the tasks of a future union? What can I and my colleagues suggest today to the All-Union Society of Inventors and Rationalizers [VOIR] or the Scientific Research Department [NIO]? Promises, competitions of innovators? But it is necessary to compete not only in the creation but also in the use of inventions. Ephemeral paper indicators will not excite anyone!

S. Trusov, honored inventor of the RSFSR, worker at MAMI [Scientific Research Institute of Automobiles and Automobile Motors]:

The main task of the Union of Inventors is to raise the prestige of inventor's work and the personality of the inventor himself. Look today at the position of an inventor in society, in the labor collective. He is a supplicant, a quarreler, a self-seeker, a schemer—what other nicknames are there?

V. Klochko, inventor of the RSFSR, associate of the Scientific Research Institute of Introscopics:

We have somehow gotten accustomed to the idea that science is the USSR Academy of Sciences and the NIO and invention is the VOIR. Now compare these strengths. The VOIR, perhaps, is trying to create for inventors the most beneficial conditions for creativity, but is does not have these strengths and possibilities. It is not necessary to forget that the VOIR has a million rationalizers and contributors. A mass organization does not have the forces to pay attention only to inventors, organized in a creative union within the framework of the VOIR, as some comrade suggest. It is naive to suppose that for 15-20 thousand members of a union the VOIR would be able to create some kind of special conditions. And since there isn't, then we are talking about a new sign, another still-born and not a creative organization. It is a completely different matter if the USSR Union of Inventors will be an independent organization, along with institutions like the GKNT [State Committee for Science and Technology], the USSR Academy of Sciences, the Soviet Cultural Fund and other authoritative organizations.

A. Zaytseva, honored inventor of the RSFSR, chief of the scientific-production association labotory "Kvant":

Is it necessary to disassociate ourselves so sharply from the VOIR? The style of work there, judging from everything, is changing, new forms and methods are appearing. It is said here that the members of the Union of Inventors can not be all inventors, but only those who have made a definite contribution to technical progress. This is primarily the level of honored inventors of the republics. This means that there will be approximately 15 thousand members in the union. They will have, besides their membership dues, to fill the budget of the union with deductions for introduction of innovations. Then the right of an inventor to his invention is necessary, and not the former relations between the inventor and the state.

V. Levchenkov, honored inventor of the RSFSR, chief of a laboratory at the scientific-production association of the All-Union Scientific Research Institute of Casting Machines:

A creative USSR Union of Inventors, having its own departmental and regional organizations, could become a real spokesman for our interests only in the case where from the very beginning of its activity the bureaucrats do not seize the power, the public figures of technical progress, directed from above. That is why it is very important to have several strong institutions with great authority. Whether or not they want the VOIR, the NIO or the VTsSPS [All-Union Central Council of Trade Unions] the fate of inventors should be determined by the inventors themselves, and not in the offices of functionaries. Time has changed, and it is time to notice perestroyka. The example of many unions, formed before our eyes, is an inspiration. It is time to pass from words to deeds.

The above named honered inventors of the RSFSR and representatives of the creative public opinion of Moscow chose a working group to assist in the creation of a USSR Union of Inventors including V. Tikhomirov (chairman), A. Orlov, V. Klochko, A. Zaytseva and M. Frolov.

Patent Services Center of Poisk Association

18140177 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 22, 17 Nov-7 Dec 87 p 2

[Article by M. Temchina under the rubric "The Pulse of the Scientific and Technical Revolution": "The Patent Services Center Will Help"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] A new service—the Scientific Methods and Educational Consultation Center—began to operate this year at the Poisk Scientific Production Association of the USSR State Committee for Inventions and Discoveries.

For the evaluation of 1 application for an invention about 2,000 documents have to be examined. If it can be used in various fields of industry, the number of patent materials increases by fivefold. Meanwhile of the 150,000-180,000 applications a little more than half are annually recognized as inventions. Every case of rejection costs the state from 55 to 100 rubles. The reason? Precisely it will be spoken about.

In front of me are the materials of Tashkent Polytechnical Institute imeni Beruni for a new structure for water supply. Four authors compiled it. Everything is in due form: a list of the documents, which testify that patent research was conducted, is attached, there is also a list of the literature, with respect to which they sought analogs—in short, everything, it would seem, is as it should be. But here is the bad luck: in accordance with the results of the evaluation it turned out that a similar invention had already been made...more than 50 years ago. Hence, the authors do not have patent knowledge, while the patent service was not able to help them.

Or there is the application from the Moscow area. The Ivanteyevka Automation and Metrology Center sent it. As it turned out, the author had several years previously published a book, in which he told in great detail about his invention. And after this he considered it possible to send an application for evaluation—apparently, he was also not acquainted with the principles of patent work.

"Why was it decided to organize such a center?" I ask its director, M.S. Saltsovskiy.

"The formed situation required this. In order to exceed the world level, it is necessary first of all to establish this level—to ascertain what the best achievements are in the field that interests you. Alas, here our developers have great deficiencies. It is a paradoxical situation: in the country enormous files of patent information have been gathered, but the creators of something new do not know how to use it efficiently, and in general know little about its possibilities—especially about the new forms of services. For today it is possible to deliver information on inventions to the consumer by such advanced and efficient means as documentary reproduction, magnetic tapes, and automated systems."

"What is the matter? Why is it happening this way?"

"I believe that one of the main reasons is an elementary lack of information."

"In short, is the task of the center to carry patent knowledge to the masses? But propaganda is only a part of the matter. It is possible to establish the most advanced information system, but the developer of new equipment will not know how to take advantage of it...."

"And it is clear why," Saltsovskiy says. "For the correct perception of new information a certain ground should first be prepared, a taste should be cultivated, if you wish, a kind of culture should be fostered. In this case it is the culture of the skillful use of the bank of patent information, which exists in our country."

"How can your center help?"

"Our work is intended not only for specialist-patent experts—it should also help the developers of new equipment. Any innovator is obliged to know how to work independently with information on inventions."

For the present the new service is organizing "universal patent education" for them and the on-the-job training of workers of patent services primarily from capital and Moscow area enterprises and organizations. Particular attention is being devoted to representatives of interbranch scientific technical complexes, and particularly to those of them, with which contracts for patent information service have already been concluded. Among them are such ones as the Kiev Svarka Interbranch Scientific Technical Complex, the Leningrad Mekhanobr Interbranch Scientific Technical Complex, and the Moscow Mikrokhirurgiya glaza Interbranch Scientific Technical Complex. In short, the sphere of activity of the center is broadening.

The workers of those organizations, which are participating in the solution of the problems connected with the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, specialists of the State Agroindustrial Committee and machine builders, power engineers, and construction workers also have already taken an interest in its initiatives. Soon the permanent seminar "Patent Information and Its Role in the Acceleration of Scientific and Technical Progress" will open. About 40 enterprises and organizations of just Moskvoretskiy Rayon of the capital will participate in its work.

The address of the center: 113035 Moscow, Raushkaya naberezhnaya, House 4. Telephone number: 230-73-74.

7807

Ordzhonikidze on Creative Scientific, Technical Work of Youth

18140222 Moscow KOMSOMOLSKAYA PRAVDA in Russian 26 Feb 88 pp 1-2

[Telephone interview with Secretary of the All-Union Komsomol Central Committee Iosif Ordzhonikidze, deputy chairman of the All-Union Coordinating Council of the Creative Scientific and Technical Work of Youth, conducted by L. Repin and V. Umnov, under the rubric "The Direct Line": "The Idea Is on the Conveyor Line"; date and occasion not given; first two paragraphs are KOMSOMOLSKAYA PRAVDA introduction]

[Text] Thousands of inventions and efficiency proposals, which could yield us considerable income, are gathering dust on shelves. Who will aid their introduction? This was discussed on the direct line with Secretary of the All-Union Komsomol Central Committee Iosif Ordzhonikidze, deputy chairman of the All-Union Coordinating Council of the Creative Scientific and Technical Work of Youth.

[Question] Hello. I am calling you from Leningrad, I am an engineer and an inventor. We hope very much that the system of the creative scientific and technical work of youth will give us real assistance. How is its formation going? Is it possible to summarize the results?

[Answer] The organizational structure of the system of the creative scientific and technical work of youth is now being formed, its economic mechanism is being debugged. This work, in the estimation of the Komsomol Central Committee and the All-Union Coordinating Council of the Creative Scientific and Technical Work of Youth, is still going slowly. It is alarming that many managers of state, soviet, economic, and trade union organs and other organizations thus far perceive the system of the creative scientific and technical work of youth as an exclusively Komsomol matter and in practice have dodged its problems.

[Question] What is to be done?

[Answer] I believe that it is necessary to support in a more resourceful manner the amateur activity of young innovators themselves and not to give anyone peace. Precisely this is the main task of Komsomol committees when forming councils of the creative scientific and technical work of youth at enterprises and associations. They have enormous rights, and, if they learn to exercise them, it is possible to surmount any bureaucratic obstacles.

[Question] Does not the system of the creative scientific and technical work of youth duplicate the activity of such organizations as scientific and technical societies, the All-Union Society of Inventors and Efficiency Experts, and the Voluntary Society for the Promotion of the Army, Aviation, and Navy?

[Answer] By no means. Moreover, the very posing of the question is not legitimate. The system of the creative scientific and technical work of youth is not a new public organization, it is an aggregate of economic organizational measures, which are aimed at the coordination of the actions and the uniting of the efforts and assets of all state and public organs in the work on the enlistment of the population, first of all young people, in creative scientific and technical work. In this connection the system does not replace the activity of existing organizations, but, on the contrary, is based on their close, interconnected work.

Into the Fund of the Creative Scientific and Technical Work of Youth

I. Semenov (Sverdlovsk): At our enterprise a club of amateur creative technical work is being set up. We would like to link it with the system of the creative scientific and technical work of youth.

[Answer] One of the tasks of the system is the development of amateur creative technical work. In conformity with the decree of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee the necessary conditions for this should be created by ministries and departments. The formation everywhere of clubs of "participants in amateur activities" should become the base for the mass creative technical work of the population. While the councils of creative scientific and technical work of youth will ensure the coordination of the work in this direction in regions and sectors of the national economy.

[Question] Nikolay Chernenko from Kiev disturbs you. I have heard much about the work of the centers of the creative scientific and technical work of youth, can they constitute competition for scientific research institutes and design bureaus?

[Answer] Of course, they can and already do. The point is that they make it possible to form a creative collective of the optimum structure, which performs work several fold more rapidly and less expensively than scientific research institutes and design bureaus. Already today they are performing an amount of work on orders of enterprises of several tens of millions of rubles, and it is rapidly increasing. Moreover, the spectrum of this work is very broad—software, waste-free technology, ecological and many other problems.

[Question] But is there not the danger that the center of the creative scientific and technical work of youth will go bankrupt?

[Answer] The centers are being set up not in a void, much organizational work on the formation of a bank of performers precedes them, and practice shows that the creative potential in regions is very large. So that the likelihood of the failure of the center of the creative scientific and technical work of youth to fulfill the economic contract is very small, and even if this is theoretically possible, the center has its own development fund, the assets of which compensate for the incurred expenses. I believe that in the immediate future ruin does not threaten the centers of the creative scientific and technical work of youth.

Our Announcement

But how will it be tomorrow? Let us ask the same question after some time, when it will be possible to tally the first result of the activity of the system of the creative scientific and technical work of youth. We hope that the forecast will prove correct.

[Question] Here in Kazan we are organizing a youth and adolescent cooperative for the filling of orders of the center of the creative scientific and technical work of youth. The cooperative has practically the same name, but in fact nearly all the performers are on labor agreements. Why is the establishment of similar production associations not envisaged in the system of the creative scientific and technical work of youth?

[Answer] The center of the creative scientific and technical work of youth can concluded agreements with cooperatives for any types of activity and, if necessary, in accordance with established procedure jointly with the interested enterprise can act as the founding organization. True, the centers of the creative scientific and technical work of youth under the new conditions in accordance with the new statute can by means of their own profit set up pilot production, acquire equipment, lease a base for this, and even build it. It is merely necessary to keep in mind that the centers of the creative scientific and technical work of youth do not yield either series-produced or small-series products. They fill the order in one copy or produce, if this is stipulated by the contract, a test batch. And they can repeat it only for a new client.

[Question] But what if one sets up an independent enterprise....

[Answer] I do not deny your view. In the immediate future the Komsomol committees will have the opportunity to establish enterprises, including joint ones. But this does not have a direct bearing on the system of the creative scientific and technical work of youth.

Express Consultation

V. Chulkov (Saratov): Is the development of a system of information on the creative scientific and technical work of youth envisaged?

[Answer] In the immediate future a permanent exhibition of the creative scientific and technical work of youth, at which workers of centers from the entire country will be able to obtain exhaustive information and to see in real life what has already been done, will be established at the Exhibition of USSR National Economic Achievements. Moreover, as of 1 July the journal NTTM-UMELETS will be published.

[Question] Yuriy Chekalin from Novomoskovsk of Tula Oblast is on the phone. A cost accounting bureau has been established at our city center of the creative scientific and technical work of youth. We deal not only with the creative scientific and technical work of youth, but also with both leisure and vocational guidance. They told us that this is prohibited.

[Answer] Do you operate on the basis of the statute on amateur associations?

[Question] Yes.

[Answer] At an amateur association it is possible to engage in the most diverse activity, but here the remuneration of labor for completed scientific and technical work in conformity with prevailing legislation is carried out within the limits of the wage fund, which the founding organization has, or by the transfer of this fund to it by the client enterprise.

In the sphere of scientific and technical activity the system of the creative scientific and technical work of youth affords much more extensive opportunities, it is more flexible and democratic. Many centers, which originated prior to the establishment of the system, or amateur associations are now being transformed into city and rayon centers of the creative scientific and technical work of youth. So you see how much more convenient it is to work.

Into the Fund of the Creative Scientific and Technical Work of Youth

S. Burov (Moscow): I work at the State Television Test Center. I would like to participate in the movement of the creative scientific and technical work of youth, I have the experience and the necessary knowledge in the area of the safety of electric instruments, particularly televisions. Where am I to turn?

[Answer] Contact Aleksandr Chesnokov, director of the Moscow Center of the Creative Scientific and Technical Work of Youth. We have a great need for such specialists.

[Question] Kiev, Aleksandr Kovalevskiy. Can our center of the creative scientific and technical work of youth form temporary creative collectives for the filling of such orders of the rayon, say, as the repair of kindergartens?

[Answer] The center is not a middleman in the job placement of young people. If there are people, who would like to deal with some interesting developments in the area of construction, to mechanize labor, to increase its productivity, and to shortening the time of construction, you could form from among them creative collectives for the performance of work in accordance with a contract with the client.

The center of the creative scientific and technical work of youth can contribute to the realization of such an order. But the center of the creative scientific and technical work of youth cannot and should not deal, for example, with the repair of apartments. Other forms exist for this: by all means, establish a cooperative for consumer services.

[Question] This is Sergey Nikolayev, a student of the Moscow Institute of Automobile Roads. Can the centers of the creative scientific and technical work of youth look to a foreign partner?

[Answer] They can. The center of the creative scientific and technical work of youth, which has a foreign client, prepares the corresponding contract for the performance of this work and submits its for consideration to the All-Union Coordinating Council of the Creative Scientific and Technical Work of Youth. While the latter after consideration sends it for official registration in accordance with established procedure to a foreign trade organization.

Our Announcement

We plan to tell in the immediate future about the center of the creative scientific and technical work of youth, which has found a foreign client. We await your letters with addresses and an account of how such a contract was concluded.

[Question] Good morning. I am calling from Minsk, this is Boris Mikhaylovich Venershteyn, chairman of the council of the creative scientific and technical work of youth of the Spetsremont Administration. Do sectorial centers of the creative scientific and technical work of youth now exist?

[Answer] They do, but for the present there are few. For example, in Bryansk at the motor vehicle works, at the Black Sea Shipping Company.

[Question] But is there a statute on the sectorial center?

[Answer] On the basis of adopted documents ministries independently approve the statute on the sectorial center of the creative scientific and technical work of youth. At the same time it is planned to consider in the immediate future at a meeting of the All-Union Coordinating Council the report of the Ministry of the Automotive Industry on the development of the system of the creative scientific and technical work of youth in the sector and to hear information of other machine building departments. After this we propose to determine the best versions of the functioning of the sectorial structure.

[Question] Poltava Oblast, Dmitriy Subbotin. How is the center of the creative scientific and technical work of youth to be linked with the activity of creative collectives attached to the All-Union Society of Inventors and Efficiency Experts and scientific and technical societies, especially in small cities? Is division worthwhile? Might it be more advisable to unite on the basis of the center of the creative scientific and technical work of youth?

[Answer] The creative collective should determine itself with whom it is to deal. The ideal arrangement cannot be dictated from above, it should be found locally.

[Question] What amount of work is needed for the opening of a new center?

[Answer] A lower limit of the amount of work of 100,000 rubles is stipulated by the recent decree of the USSR State Committee for Labor and Social Problems and the All-Union Central Council of Trade Unions.

Express Consultation

Ye. Nikolayeva (Alma-Ata): As is well known, one out of every three inventions and efficiency proposals does not find application. How long will this continue?

The draft of a fundamentally new document—the Law on Inventions—will be published in the immediate future. It will be discussed nationally and, I believe, will improve much in this difficult matter.... What do you think about the competition of the system of the creative scientific and technical work of youth with scientific and technical cooperatives? A large number of such associations are being established in Kazan. The wage at them is higher than in the system of the creative scientific and technical work of youth, there is less control there. That is, they are under obviously better conditions....

[Answer] Such a problem actually exists. But at first I would not call it an insoluble problem. For the present there is enough work for everyone. Here, for example, there already exist centers which do not have enough time to digest all the orders.... While subsequently everything will depend on how skillfully you and I conduct business. One must not preserve a monopoly for some one system or form of work.

Our Announcement

Our correspondent has already written out an authorization for a business trip in this regard. Soon you will be able to read his account on how the interrelations of the center of the creative scientific and technical work of youth and the scientific and technical cooperative were established in one of the cities.

[Question] Sergey Pokatilov, an instructor of the Kishinev City Komsomol Committee. We do not agree that the All-Union Coordinating Council has established a strict figure of deductions for the city funds of the creative scientific and technical work of youth—27 percent. Our city has its own specific nature, there are three scientific and technical cooperatives, in which the deductions are at most 10 percent.

[Answer] A uniform standard has been established for all centers: deductions of 30 percent (3 percent for the all-union fund, 27 percent for the local fund). We collectively worked out this figure with the directors of already existing centers with allowance made for the opinions of socialists. I believe that we are not restricting the centers of the creative scientific and technical work of youth, especially as these assets are being used for a very necessary matter—the development of creative technical work, especially that of children.

[Question] Aleksandr Kopkov, Krasnoyarsk Kray. I understand it as follows: the center of the creative scientific and technical work of youth establishes a temporary creative youth collective, which in accordance with a contract with an enterprise performs some job. Why is this intermediate unit necessary? Why cannot the enterprise itself establish a temporary creative youth collective?

[Answer] The center performs purely intermediary functions. After all, we are well aware that a large number of both individual inventors and creative collectives for years cannot place an order, because they do not find interested people. Assume that one creative collective was lucky, it found a client. But what about all the others? They do not even know to whom to turn. They will not go about enterprises and offer their services.... That is what the center of the creative scientific and technical work of youth is needed for.

7807

Stereotypes of Thinking on Invention

18140243 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 4, 16 Feb-7 Mar 88 pp 1, 4-5

[Article by Candidate of Economic Sciences N. Lynnik, chief of the Department of Economics and Management of the All-Union Scientific Research Institute of Patent Information of the State Committee for Inventions and Discoveries: "Invention From Six Standpoints"; passages in italics are as published; first two paragraphs are NTR: PROBLEMY I RESHENIYA introduction]

[Text] Invention, the problems of the vigorous and mass use of its fruits, suggestions on the correct stimulation of the developers of new technical solutions, specific, although not always very specific, criticism of the conclusions of experts—all these questions first burst in a mighty stream onto the pages of newspapers and journals and into radio and television broadcasts, then suddenly fade, as if gathering strength for a new burst.

Apparently, one will not have to wait long for it. The drawing up of the draft of the new Law on Invention is at the stage of completion. The forthcoming discussion will be more fruitful, the more resolutely the most prevalent stereotypes of thinking are removed from the discussion. The article of Candidate of Economic Sciences N. Lynnik is about this.

People have been writing much, for a long time, and at times very emotionally about the problems of invention, transforming the personal inventing experience. At first glance, many constructive suggestions are being voiced, but all of them in the end reduce to five stereotypic opinions.

The first stereotype. The economic conditions of the scientific production activity of enterprises and the economic mechanism as a whole do not satisfy the requirements of the speeding up of the use of inventions and the increase of the volumes and scale of their application.

Yes, undoubtedly, the introduction of inventions is often a troublesome matter and requires significant material resources without 100-percent guarantees of the anticipated impact. In case of a "deficit economy" the enterprise has no need to agree to taking risks and to change the formed technology of production. At the same time the planning mechanism of research and development, just as administrative methods of influence obviously did not work. All this is well known and has been discussed, and a final verdict was passed on the old methods of introducing technical innovations. Another matter is panaceas.... The authors of articles of any editorial mail see, in particular, a way out of the situation in the establishment of cost accounting and cooperative engineering and consulting introducing firms. The debut idea is a fine one, which has its roots in the history of the 1960's, in the social forms of the participation of the scientific and technical intelligentsia in inventing and introducing activity, and in the productive experience of the fraternal countries. General-purpose firms, in my opinion, are not capable of increased mobility, sooner or later they will degenerate into traditional scientific research institutes and design bureaus.

But now let us imagine: the evolution of the economic reform led to the establishment of precisely such a one—a flexible, harmonious, diverse system of firms. Will it be able to solve all the problems that are characteristic of invention, if one has in mind the process of shortening the path from the development of a technical innovation in a design version to introduction in production? Only at a specific stage, at the initial section: approval, preparation for use....

But then comes introduction. Imagine that a plant has been ordered to put into mass production a model of a new machine. It will be more efficient than the former machine (for the consumer) and less expensive in production proper. It would seem what can be better?! That is not so: precisely the low price of a product is disadvantageous for the producer because of the expenditure method of pricing—a capital-intensive product is advantageous for the plant. The more labor, metal, and energy resources are invested, the greater the wholesale price and, hence, the profit are. In the law on the state enterprise it is stated: the expenditure principle of pricing will also be retained in the future, but it will be supplemented by other stimuli, which induce one to improve the quality and national economic efficiency of products under the conditions of full cost accounting, but in the absence of competition and market alternatives, which may emerge years later, when the cost accounting economy has passed the stage of restructuring and the formation of an integrated economic system has been completed.

It seems to me: effective economic stimuli are favorable tax levies, minimum percentage rates for credits, breaks on the term of repayment of credits (for example, up to 15 years), exemption from taxes for the output of products on the basis of highly efficient inventions, the right to an additional, nontaxable profit for the sale of patent licenses to both foreign and domestic firms and enterprises. Incidentally, levers of influence of this sort exist in several fraternal socialist countries, for example, in the GDR, Poland, and Hungary. And in capitalist states as well—the FRG, Italy, and others. So that steps of state influence on the production of items with high consumer properties will by no means be unnecessary under the conditions of full cost accounting, wholesale trade in means of production, and contract prices for products.

The second stereotype. One should invent only what is necessary within the framework of the fulfillment of an official assignment, for the meeting of the current needs of society, the resolution of "bottlenecks" of production, and so forth.

The third stereotype. It is necessary to stimulate the introduction (use) of inventions, and not their development (creation), inasmuch as, they say, only about a third of inventions find practical application, the remainder for the most part are "ballast," and they are created out of the desire to obtain an incentive reward or to have an additional scientific publication (an attribute of preparation for the defense of a dissertation).

It would seem that in both cases the "authors" of these opinions are worried about the economics of invention. But, as is known, a miser pays twice. It is impossible to strictly regulate creative inventing work by the blinders of plans and by narrow specialized technical assignments (although this is also vitally necessary). The immediacy of goals and narrow production pragmatism reduce the scale and narrow inventive thinking. Without the freedom of creativity and work for the future and without the development of inventions, which anticipate the marketing needs of production, it is also difficult to expect the development of truly revolutionary technologies.

And in general: If an invention has not found industrial application, is it always possible to assign it to the category of useless ones? But what if it is ahead of its times?! Or what if it can serve as a prototype for some other, more efficient invention? Apart from all else, it finds application in case of the appraisal of inventions, when it is necessary to verify the ability of declared technical solutions to be protected. And so forth.

It is another matter that in the diversity of cost accounting inventing organizational structures firms, which specialize in the development of precisely broad-scale technologies that are ahead of the times, should also hold their place of honor. Most likely, such operations, which are aimed at the future, can be financed on the basis of a state order.

The fourth stereotype. The system of the material stimulation of the authors of inventions is not efficient, is excessively elastic, and is conducive to abuses of both managers, at whose disposal the system of incentive is, and the authors of inventions.

That is what it is like. The system of the material stimulation of inventors actually is extremely complicated. In order to obtain what is legally his own and has been earned, the inventor should step by step, barrier by barrier overcome bureaucratic obstacles, and in the end in the eyes of fellow workers and the community a person appears in some distorted light—he looks like a litigious person, a stubborn, boring mercantalist who opposes himself to the collective. The system of material stimulation should operate with the irreproachability of an automatic machine: how much one has earned is how much one has received. I believe that in this sense the Law on Inventions, which is at the stage of drafting, will put everything in its place. In the sense that the right of the inventor to a reward and the duty and responsibility of the workers of the corresponding administrative services to pay royalties in strict conformity with the law will be precisely and clearly formulated.

The fifth stereotype. The quality of the appraisal of inventions does not meet present requirements (moreover, as a rule, this is the opinion of those who were denied the issuance of author's certificates for inventions).

I will not deny it—the system of appraisal is far from perfect, it is being constantly and widely discussed by the scientific and technical community. The most diverse suggestions on the improvement of the procedure of appraisal are being advanced—to increase the professional level of the specialists of the All-Union Scientific Research Institute of State Patent Examination, to computerize the system of expert evaluations, to institute a departmentally independent board of arbitration, which is capable of settling more objectively the controversial questions which arise between the applicant and the expert service, and so on.

I am convinced: if all these suggestions receive practical expression, qualitative changes will not occur.

If only because the author-applicant most often is inclined to overestimate his invention—this is his creation, which was born in "the throes of creativity," perhaps an only one, but perhaps the last one, his personal creative Mont Blanc. But the expert—so it was, is, and will be—in his very essence is the protector of state interest. Emotional evaluations are contra-indicated to him. And at the same time it is difficult to blame the author-applicant for a subjective attitude toward his creation, for the aspiration to form public opinion about it and in its favor, particularly in the press.... Thus a biased attitude toward expert conflicts forms. This must be borne in mind. In my opinion, the problem of appraisal is a perpetual problem. Which, of course, does not eliminate the need to improve in a specific, scientifically sound manner the work, methods, and system of this section of inventing.

At times the impression is formed that invention as an entire field is also accessible to each and everyone even without specialized knowledge. The number of authorities is growing, the flow of suggestions, which have been voiced in public and have been published in the press repeatedly, is increasing. The effect of the printed word creates at times the illusion of truth even by doubtful ideas, which lay claim to universality. Yet meanwhile we have very few real specialists in the field of invention, but then have very many quacks. That is why the level of analysis and discussions is so low, the one-sidedness and incompleteness of the suggestions on restructuring exist.

The management of invention is a special area of activity, which requires specific knowledge and skills. The professional should also deal with the introduction of inventions. Our technical higher educational institutions do not train specialists of either type, and this is incorrect. Problems, problems, problems.

But all of them can be solved only in the context of the radical economic reform. In the end the increased demand for inventions can promote a change of the system of values in our business. It is pointless to restructure the superstructure in isolation of the base. Invention cannot effectively exist as a monosystem. It is a part of the whole.

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Italian Advertising Services for Soviet Firms

18140244 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 4, 16 Feb-7 Mar 88 pp 2-3

[Interview with Mrs. Rina Ronci, representative of the board of the Advertisement Italia firm, by NTR: PROBLEMY I RESHENIYA correspondent A. Rumyantsev: "On Advertising Professionally"; date, place, and occasion not given; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] The new conditions of economic management are increasing the role of advertising as a tool of the contact of production and consumption, supply and demand. The time has come for the study and use of the most effective methods of this powerful "motive force of trade." Mrs Rina Ronci, representative of the board of the Advertisement Italia firm, answers the questions of NTR correspondent A. Rumyantsev.

[Question] A highly developed industrial society, apparently, is inconceivable without advertising. But is it possible to avoid such development, when it becomes a part of mass culture, which in addition appeals to not the best feelings of a person?

[Answer] You are speaking only about the visible and at times hypertrophied part of the advertising business. Consumer goods producers, who often entrust the promotion on the market of one item or another exclusively to advertising, are interested in informative reports which are aimed directly at the consumer. But it is neither the only nor the decisive means of information. Specialists have established that informative reports among enterprises, that is, information that is aimed at the sale of items or services of one enterprise to another, are less conspicuous to ordinary consumers, but are of much greater economic importance. Such information should become the first step in the direction of personal contact, which can lead to commercial negotiations and subsequently to the signing of a contract. It is natural that the establishment of a direct dialog with a partner requires highly qualified professional skills. Our firm also offers precisely these skills to Soviet firms which have received the right of direct access to foreign markets.

[Question] What specific services of the firm can your clients take advantage of?

[Answer] We are ready to make available to Soviet institutions and enterprises an entire set of services for the drawing up of informative reports meant for Italian enterprises, and vice versa. The promotion of Soviet goods can also be organized on the markets of other West European countries, inasmuch as our firm is linked to the European Computer Network.

[Question] But the success of any commercial undertaking depends on a knowledge of the basic elements of the market....

[Answer] By operating directly or by using the experience of the organizations that are cooperating with us, we are capable of conducting in Italy any economic studies.

[Question] What special "professional skills" should an advertising firm have?

[Answer] There are many of them. In interworks advertising relations the depiction of an enterprise in the mass media plays a leading role. Here everything is important: to find the most appropriate mass media for the given type of advertising, to compile a calendar of reports, to buy space for them in periodicals and on radio and television. And when the firms, which may be potential clients, are identified, it is necessary to work on the text of the report so that a response would be guaranteed. But this is a "secret of the firm," which is based on many years of experience of working within the broad boundaries of the international market. We invite to be convinced of this all Soviet enterprises which are prepared for the broadening of economic, scientific, and technical relations with foreign partners.

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American, Soviet Views of Sales of Technology

18140246 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 4, 16 Feb-7 Mar 88 p 7

[Article: "Is Technology to Be Sold? Western Corporations Acquire a Taste for Purchases of Technologies Developed in the Socialist Countries"]

[Text]

The American View. G. Garret Deyoung, HIGH TECHNOLOGY BUSINESS, November 1987

A larger and larger number of companies believe that technologies of the socialist countries contain new business opportunities that promise large profits. Agreements of this sort are becoming more and more ordinary—in part because the patent organizations of the socialist countries have finally begun to actively promote the advancement of their technologies to the western market. Soviet leader Mikhail Gorbachev has set the goal to achieve the greater competitive ability of industrial products on markets of the West, mainly by the exchange of technologies and the establishment of joint enterprises, as well as by more intensive trade.

Here are examples of recent deals of American companies which have availed themselves of the new economic situation.

Diversified Tech in Salt Lake City acquired the rights to the production of a plastic, which was developed in the USSR and is used in bone operations. The annual market of this product in the United States and Europe will amount of $1.6 billion.

Plasmafusion of Michigan purchased in Czechoslovakia a license for a process of obtaining high temperature plasma, and now this process is being used at 34 joint enterprises of this firm with steelmaking, chemical, and food companies.

These and other companies would like to repeat the success of one of the earliest agreements of this sort, which marked the beginning of the sector, which produces flexible contact lenses and is valued in all at $700 million. It is a matter of the purchase in 1965 by the New York National Patent Corporation of the right to the production of water-permeable plastic, which was developed by chemist Otto Victerl at the Czechoslovak Academy of Sciences.

Thus far metallurgical companies and firms in the area of the technology of materials, for example, plastics, as well as in the area of medicine have derived the greatest profit from cooperation with the socialist countries. Researchers from the socialist countries are working on many of the technologies, to which American companies are giving the greatest preference.

"As a rule, the socialist countries for the most part are oriented toward long-range research and development programs, which have a good theoretical basis in such fields as physics, chemistry, and technical disciplines," says Barney O'Miara, chairman of Kaiser Research (Virginia), which specializes in the organization of deals between American and foreign companies."

"Usually they experience a large number of difficulties when transferring a technology from the laboratory to the shop, mainly because a multilevel system of consultations and coordination exists," says William L. Frankhauser, a consultant for problems of materials from Bedford (Virginia). As a result, says O'Miara, in the socialist countries it is possible to "get" to the market only about 10 percent of the new technological processes.

It is here that the American companies, which purchase or acquire a patent for a basic technology or technological process, go into action. "They are not our competitors, therefore, they have no stimulus for refusing to grant us licenses," says Kaiser Research President John Kaiser. "Moreover," he continues, "it is often possible to acquire the technical know-how of socialist countries at a low price: their expenditures on research and development are much lower."

One of the most significant advantages of the importing of technology from the socialist countries is that fact that the purchased technological methods or products are often unknown in the West. The company that purchases a license for the only product or process of its type, obtains a significant advantage over its competitors.

But at times just the prospect of a profitable deal is insufficient to attract American companies to the conclusion of an agreement with socialist countries. Several agreements were never signed as a result of lengthy delays and bureaucratic obstacles, which complicate such deals.

"I would advise a company, which has the serious intention to acquire technology from a socialist country," says Leo Welt, president of the consulting firm Welt International, "to be patient. Do not think that this is so easy. But if you have done much preliminary work and have found a product or process, which is unknown in the West, a profitable deal will justify your efforts."

The Point of View of a Soviet Specialist. V. Vladimirov, senior scientific associate of the Institute of World Economics and International Relations of the USSR Academy of Science

An article of this sort to a certain extent is a rarity in the American press. It views Soviet-American relations from the standpoint of the benefits which American corporations are deriving from economic relations with the Soviet Union and other socialist countries. A number of examples, which are unknown to Americans, of recent deals of American companies, which are striving to profit by the new economic situation, are cited in the journal. However, it would be possible to supplement these data. Thus, hardly anyone in the United States knows that the rails of the metro in Washington, as well as the pipes, which are being laid by American firms on the ocean bottom and for the recovery of gas on the coastal shelf, are being welded by equipment, which was developed and built in the USSR, that American surgeons are using in their work instruments that have been manufactured in accordance with Soviet licenses, and that by 1990 three-fourths of the steel produced in the United States will be smelted on the basis of the original Soviet technology of continuous casting.

While stating that until recently a limited group of firms derived the basic advantage from cooperation with the socialist countries, the journal expresses the well-founded hope for the development of contacts in a number of other areas as well. The making of many of the listed technologies available to the West fully conforms to the intentions and potentials of the Soviet Union. According to the data of the Litsenzintorg Foreign Trade Association, in its portfolio there are about 2,000 developments in priority areas, which were made by scientific research institutes and enterprises and owing to which Litsenzintorg could conclude long-term commercial contracts with more than 2,000 companies and organizations in 40 countries of the world.

In essence the American journal shares the point of view, which was recently expressed by the English newspaper THE FINANCIAL TIMES. It stressed that the underestimation or the lack of attention to achievements of the USSR in a number of areas of the most advanced

technologies can lead the West to major mistakes. Moreover, it is noted in the article in question, only in the Soviet Union can western countries find a technology that will make their products be of better quality and less expensive. But this is far from enough to attract American partners.

However, it is noted in the article, several agreements were never signed as a result of lengthy delays and bureaucratic obstacles, which still occur in the socialist countries.

That is why in the West particular attention is now being devoted to the analysis of the steps on the changeover of the Soviet Union to new forms of international economic cooperation and especially to the drafting and approval of enforceable enactments, which contain fundamentally new appraisals of the specific conditions of the establishment and operation of joint enterprises.

The new approach of the Soviet Union to modern international relations, which is based on the recognition of the interdependence of all the members of the international community, is finding in the West more and more supporters, who realize that discrimination, especially in the area of technology, cannot exist in the business world. No one can dominate in all spheres of industry, science, and engineering thought.

That is precisely why the aspiration of the administration and military circles of the United States by stepping up the activity of the Coordinating Committee to hinder the scientific and technical progress of the socialist countries is encountering more and more criticism both of U.S. allies, which see in this the secret desire of Washington to ensure the advantage of American industry in the competitive struggle with European firms, and, what is very important, of U.S. business circles. These circles believe that the attempts to manipulate Soviet-American trade for the sake of achieving desired political goals first of all harm the competitive ability of American firms on world markets.

Thus, according to studies made by the American National Academy, the strict monitoring of exports to the socialist countries annually costs the United States $9 billion and is turning into the loss of 18,000 new workplaces.

The recognition of the fact that it is impossible to reduce the aspiration to take the path of the improvement, diversification, and extension of international cooperation just to someone's advantage or disadvantage, is a trait of the new political thinking. Such cooperation in the end signifies an increase of material goods for everyone. But, as applied to countries with different sociopolitical systems, this signifies something more—the increase of mutual understanding and trust, on which in many respects the fate of modern civilization depends.

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Lithuanian Academy Activity During 11th Five-Year Plan

18140129 Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B, KHIMIYA, TEKHNIKA, FIZICHESKAYA GEOGRAFIYA in Russian No 3, Jul-Sep 87 pp 132-143

[Article by R. Barauskas, L. Gutauskene, A. Ramonas, and V. Petrauskas: "The Basic Result of the Activity of the Lithuanian SSR Academy of Sciences During the 11th Five-Year Plan (1981-1985)"

[Text] During the 11th Five-Year Plan at the Academy of Sciences research was successfully developed in all 18 basic directions of scientific research work, which were approved by Decree No 301 of the Lithuanian CP Central Committee and the Lithuanian SSR Council of Ministers of 30 October 1978.[1] The fact that, in fulfilling the instructions of the party on the resolute and all-round acceleration of scientific and technical progress, the Presidium of the Academy of Sciences took vigorous steps on the strengthening of the contacts of science with practice, the increase of the efficiency of scientific research work, and the introduction of its results in practice and systematically improved the planning and organization of this work and the monitoring of it, is characteristic of the scientific and scientific organizational activity of the Academy of Sciences during the 11th Five-Year Plan. For the acceleration and the increase of the efficiency of the introduction in production of the results of the scientific research of institutions of the Academy of Sciences during the years of the 11th Five-Year Plan scientific production complexes and scientific production associations began to be established and began to operate (see below) and the experimental base of the Academy of Sciences was strengthened and expanded (see below).

These and other steps on the improvement of the scientific and scientific organizational activity of the Academy of Sciences enabled the Academy of Sciences to achieve during the years of the 11th Five-Year Plan in the basic areas of activity significantly higher indicators than during the 10th Five-Year Plan.[2]

In fulfilling the annual thematic plans of scientific research work (the total quantitative indicators of the fulfillment of the thematic plans of the Academy of Sciences are presented in Table 1), the institutes of the Academy of Sciences in individual fields of science and scientific research achieved the following most important results.[3]

Table 1 shows the fulfillment of the thematic plan of scientific research work of the Academy of Sciences during the 10th and 11th Five-Year Plans, including the themes being worked on (total), basic research, scientific and technical work, budget-carried work, economic contractual work, and the themes completed (total).

The Institute of Mathematics and Cybernetics. In the area of studies of the limit theorems of probability theory new methods of the asymptotic analysis of dependent random variables were developed and the known methods were improved. Theorems of random processes with values in regions with piecewise smooth boundaries were proven. These theorems were applied to the asymptotic analysis of loaded networks of queueing systems. General Markovian processes on branched manifolds, which meet on the surface of branching versatile conditions of the Feller-Wentzel type, were constructed and the conditions of weak convergence to these processes were studied.

Numerical methods of solving boundary problems for nonlinear elliptical equations with an integral condition were devised and studied. Using these methods, important practical problems of vibration engineering and microelectronics were solved. A system of the computer-aided designing of packages of applied programs, which is based on the methods of structural analysis, was developed.

The Institute of Physics. The physical phenomenon of the regrouping in individual cases of the electrons of an atom into qualitatively different shells, which are described by the isospin quantum number, was predicted theoretically and substantiated mathematically. The possibility of the occurrence of interparticle correlation through wave processes in a medium was predicted theoretically. It was shown that the excitation of a medium can have a much stronger effect on noise than on the response. The phenomenon of induced combinational self-transformation, which occurs in passively mode-locked lasers based on crystals of binary tungstates and molybdates, was detected and studied. Successful tests of an electron diffraction camera, which was developed at the institute, for the 6-meter telescope of the USSR Academy of Sciences, which is the largest in the world, were conducted. The camera increases the penetrating power of the system by two stellar magnitudes. New laser technologies, which increase by four- to sevenfold the wear resistance of milling cutters, cutting tools, circular saws, and upsetter dies, were introduced in production.

The Institute of Semiconductor Physics. The theory of the distribution of hot electrons, which is deformed in pulse space and leads to the generation of far infrared and shortwave microwave radiation, was developed. The previously unknown phenomenon of random self-excited oscillations, which are distinguished by a high spectral current density, was detected in uniform crystals that had been doped with deep impurities. The effect of the no-background tunnelling of electrons from the levels of shallow donors into the conduction band in a strong electric field was detected and studied experimentally in silicon. The previously unknown resonance generation and amplification of the even harmonics of electromagnetic waves in case of threshold switching in semiconductor plasma in a microwave field were found.

Methods and equipment for the local contactless measurement and study of the electrical parameters of semiconductor materials were developed on the basis of the use of the phenomenon of the propagation of electromagnetic waves in semiconductor plasma. Transducers of a low and high level of microwave power based on silicon single crystals were developed. The transducers for the measurement of a magnetic field and pulse pressure, which were developed at the institute, are being produced by the pilot plant of the institute.

The Institute of Physical Technical Problems of Energetics. Methods of calculating a turbulent flow, which make it possible on the basis of the solution of elliptical equations of pulse and energy transfer to study the laws of flow and heat exchange in channels and devices of different geometry, were developed. Numerical studies of turbulent biased convection in ring channels in case of changing physical properties, which showed that in ring channels, as well as in pipes, given specific parameters of the thermogravitational forces the increase of heat exchange is possible, were performed. Methods of the construction of a new class of control systems of random processes—adaptive systems with a forecasting model, which were made the basis of developments on the devising of adaptive control systems of processes in nuclear power reactors, power-generating units, and other power facilities, were developed. The processes of heat transfer and aerodynamics in systems, which are cooled by gas and liquid flows and are used when developing nuclear reactors, as well as heat exchangers of different purposes, were studied.

The Institute of Chemistry and Chemical Technology. While studying the principles of the electrolytic and chemical deposition of metals and their alloys, it turned out that the processes of the chemical deposition of metals most often are of electrochemical origin. The theory of the slow surface diffusion of adsorbed atoms, on the basis of which the peculiarities of the kinetics of electrochemical processes were studied, was developed using mathematical methods. A quantitative theory, which describes the basis stages of the cumulative process of the electrodeposition of metals in complex systems, was developed and new methods of studying the kinetics and mechanisms of electrode reactions were proposed. A complex of the automation of electrochemical research was developed.

New electroplating technologies: the process of the acid lustrous copper plating of printed circuit boards; the process of lustrous nickel plating, which makes it possible to obtain true, elastic surfaces with small internal stresses; the technology of obtaining mirror coatings of Au-Cu-Cd alloy; the technology of obtaining coatings of Ni-Fe alloy, which makes it possible to save scarce Ni; the technology of coating miniature switches of contacts with wear-resistant two-layer Pd-Ni and Au, and others, were developed and introduced in production.

The Institute of Biochemistry. The oxidation-reduction reactions of proteins and enzymes, which were adsorbed on conducting matrices, were studied. Methods of changing the molecular structure of the phase separation, which are conducive to high speeds of the exchange of electrons between the active center of an enzyme and the conductor, were established. The Ekzan-G enzymatic glucose analyzer was developed and is being introduced at medical institutions. It was established that the development of an immunosuppressive state in a body that is ill with leukosis involves the expression of the structures, which are specific to the leukosis virus, on the surface of immunocompetent cells, the predominance of T-suppressors, and the emergence of blocking factors.

Methods of the detection of leukemic cells and viral antigens in the body were developed, methods of the early diagnosis of leukoses of animals were developed and introduced on their basis. New antileukosis-antitumor preparations—pafentsil and hexaphosphamide—were developed and introduced in medical practice, troksozon and fenanol were presented for clinical tests.

The Institute of Botany. Principles and methods of the selection and establishment of specially protected natural territories were developed and were introduced in the Comprehensive Plan of Nature Conservation of the Lithuanian SSR for the Period to 2000, the strategy of nature conservation in the republic to the end of this century was outlined. On the basis of the results of detailed studies of the tidal meadows of the lower course of the Nyamunas (Neman) River recommendations on the increase of the productivity of these meadows were prepared and are being introduced. Methods of studying the effect of phytohormones on the exchange of proteins in cell structures were developed. The new physiologically active regulators of plant growth TA-12, TA-57, and TA-59 were synthesized. Under experimental conditions of changing gravity the threshold of the geotropic sensitivity of plants was established and it was demonstrated that under the conditions of space flights plants can go through the full cycle of development and produce live seeds.

The Institute of Zoology and Parasitology. The ecological, immune, and genetic mechanisms of the interaction of populations of parasites and their hosts and the importance of parasitism for the polymorphism and microevolution of populations were studied. The laws of the ecological processes, which occur in the cooling ponds of thermal electric power plants, were established. The role of pedobionts in the processes of the self-purification of soil was identified. Mathematical models, which make it possible to forecast ornithological situations, were developed. The role of individual chemical components in the mechanism of the pheromone communication of insects was established, a spatial model of the multicomponent pheromone signal was developed. The role of obligate symbiosis between animals and the

microorganisms of their intestine for the synthesis of biologically active compounds, digestion, and the processes of the formation of immunity was identified.

The Institute of Economics. A long-range comprehensive plan of the development of the unified transportation system of the Lithuanian SSR was prepared. An analysis of the existing level of the use of natural resources was made, means for the improvement of their efficient use and nature conservation were outlined. The Procedural Recommendations on the Long-Range Forecasting of the Regional Economy were prepared. The basic problems and the proportions for the development of the national economy of the republic for the period to 2005 were outlined.

The Institute of Philosophy, Sociology, and Law. The monographs: "The Prevention of Offenses Among Working Youth," "The Classical Concept of Matter. A Historical Methodological Analysis," "Speech, Thought, and Reality," and "The Philosophical Concepts of Catholic Modernism" were published.

The Institute of History. The two-volume generalizing publication "The History of the Lithuanian SSR," in which the historical development of the Lithuanian people from ancient times to our days is generalized, was prepared. Volume 1 of the multivolume publication "The Lithuanian Statute," in which an analysis of the First Lithuanian Statute (1529)—a unique written and cultural monument of the history, state, and law of the Lithuanian, Belorussian, Ukrainian, and Russian peoples of the era of feudalism—is given, was published.

The Institute of the Lithuanian Language and Literature. Major works on language and literature were prepared and published: Volume 13 of the academic "Dictionary of the Lithuanian Language," "The Grammatical System of the Lithuanian Language," "Lithuanian Folklore Studies Prior to the 19th Century," "Comedy in Lithuanian Soviet Prose," and a monograph on the life and creative work of the Lithuanian woman writer Shatriyes-Ragana.

During the 11th Five-Year Plan the Academy of Sciences continued the coordination of the basic, scientific, and technical research being conducted at scientific institutions and higher educational institutions of the republic. The Republic Council for the Coordination of Scientific Activity in the Natural and Social Sciences attached to the Presidium of the Academy of Sciences, which has 27 problem councils, in which more than 650 most prominent scientists and specialists of the republic worked, performed this work. The themes of the research coordinated by the Academy of Sciences increased as compared with the 10th Five-Year Plan by 17.5 percent, the themes of the Academy of Sciences itself increased by 15.5 percent.

With the increase of the amount of scientific research and the broadening of its themes the number of staff members of the Academy of Sciences grew and the skills of scientific associates increased (Tables 2 and 3).

Table 2 shows the number of staff members (at the end of the year) during the 10th and 11th Five-Year Plans, including all staff members, scientific associates, doctors of sciences, candidates of sciences, scientific associates who do not have an academic degree, and graduate students.

Table 3 shows the defense of dissertations and the number of doctors and candidates of sciences at the Academy of Sciences during the 10th and 11th Five-Year Plans, including doctoral dissertations defended, candidate dissertations defended, doctors of sciences, and candidates of sciences.

By the end of the 11th Five-Year Plan at the institutes of the Academy of Sciences there were 160 subdivisions (departments, laboratories, bases, sections, and plants of experimental production). During the 11th Five-Year Plan 20 new departments and laboratories were established.

During the 11th Five-Year Plan successfully developed international scientific relations (Table 4), as well as the scientific conferences, meetings, and symposiums, which were organized by the Academy of Sciences (Table 5), contributed to the development and the increase of the level of the scientific research of the Academy of Sciences. Inventing activity was further expanded (Table 6), good results were achieved in publishing activity (Table 7) and in the area of the popularization of scientific knowledge and achievements (Table 8), capital investments (Table 9) and financing (Table 10) increased significantly.

Table 4 shows the international relations of the Academy of Sciences during the 10th and 11th Five-Year Plans, including foreign scientists who came to the Academy of Sciences and scientists of the Academy of Sciences who were sent abroad.

Table 5 shows scientific conferences, meetings, and symposiums, which were organized by the Academy of Sciences during the 10th and 11th Five-Year Plans, including All-Union measures.

Table 6 shows inventions from the Academy of Sciences during the 10th and 11th Five-Year Plans, including applications for inventions submitted and inventor's certificates received.

Table 7 shows the publishing activity of the Academy of Sciences during the 10th and 11th Five-Year Plan, including the number of publications and the volume of publications (printer's sheets).

The majority of research, which was conducted by the Academy of Sciences during the 11th Five-Year Plan, was performed within the framework of various comprehensive programs.[4] In all the Academy of Sciences took part in the formulation of 23 all-union, 15 republic, and 7 interdepartmental programs. The scientific research in accordance with these programs in 1985 amounted to 49 percent of all the themes of scientific research of the Academy of Sciences.

During the 11th Five-Year Plan at the Academy of Sciences particular attention was directed to the implementation in practice of the results of basic research. At the institutes a large number of new technologies and models of new equipment and instruments, which made it possible to increase the quality of products of industry, to decrease the materials-output and power-output ratios of production processes, and to increase the level of the automation and mechanization of production, were developed and in many cases were introduced in production. In all the institutes of the Academy of Sciences introduced 642 jobs, an economic impact in the amount of 98.1 million rubles was obtained (Table 11). The average economic impact from the introduction of a job increased as compared with the 10th Five-Year Plan by twofold and during the 11th Five-Year Plan came to 134,000 rubles.

For the purpose of improving the integration of science with production the Presidium of the Academy of Sciences by Decree No 348 of 5 October 1981 organized the Elektronika Scientific Production Complex,[5] the first in the republic, which by the end of 1985 united 17 academic institutions, higher educational institutions, and sectorial scientific research institutions and enterprises of the electronics industry (the basic scientific organization of the complex is the Institute of Semiconductor Physics of the Academy of Sciences). The rapid and intensive development of basic research on semiconductor electronics, the prompt introduction in production, and the improvement of semiconductor instruments, which have been developed on the basis of this research, are one of the basic tasks of the Elektronika Scientific Production Complex.

Taking into account the successful activity of the Elektronika Scientific Production Complex, the Presidium of the Academy of Sciences adopted on 27 June 1983 Decree No 191 "On the Organization of Scientific Production Complexes and Associations," in which it envisaged the establishment of another two scientific production associations—the Galvanotekhnika Association (the basic scientific organization is the Institute of Chemistry and Chemical Technology of the Academy of Sciences) and the Lazery Association (the basic scientific organization is the Institute of Physics of the Academy of Sciences). They were established by Decree No 268 of the Presidium of the Academy of Sciences of 5 August 1985 "On the Lazery Scientific Production Association and the Galvanotekhnika Scientific Production Association."[6] The Lazery Scientific Production Association at enterprises of Vilnius, Kaunas, Shyaulyay, Ukmegre, and other cities has already successfully introduced technological lasers, which have made it possible to lengthen the service life of tools and assemblies of machines and to increase the saving of materials by three- to fivefold.

This organizational form of the integration of science and production made it possible to combine sectorial and territorial interests efficiently for the purpose of the better use of the scientific and technical potential, which exists in the republic, for the solution of problems of the development of the national economy.

During the 11th Five-Year Plan work was successfully performed in conformity with the plan of comprehensive scientific and technical cooperation between the Academy of Sciences and the city of Shyaulyay during 1981-1985, which was approved on 13 November 1980 (Decision No 54/47).[7] In implementing this plan, institutes of the Academy of Sciences completed the study of 158 themes, the results of research with respect to 85 percent of the themes were introduced at production organizations of the city and yielded an annual economic impact in the amount of 1.8 million rubles. This cooperation contributed not only to the growth of the production potential of Shyaulyay, but also to the increase of the skills of the scientific and technical personnel of the city—people of Shyaulyay defended 7 candidate dissertations, more than 120 specialists of the city underwent practical training at laboratories and experimental bases of the Academy of Sciences, more than 70 seminars and schools were organized in Shyaulyay.

During the years of the 11th Five-Year Plan the base of experimental production of the Academy of Sciences was expanded appreciably. By the end of 1985 3 pilot experimental plants and 11 experimental production sections, in which more than 1,200 people worked, were in operation at the Academy of Sciences (at the end of 1980 there were 6 such subdivisions at the Academy of Sciences, 600 people worked in them).[8]

During the years of the 11th Five-Year Plan the laboratories of the Institute of Chemistry and Chemical Technology and the Institute of Semiconductor Physics, which are joint ones with enterprises of the republic, also operated successfully.

On 5 August 1985 the Lithuanian SSR State Committee for the Supply of Production Equipment for Agriculture (Litselkhoztekhnika) and the Presidium of the Academy of Sciences for the purposes of increasing the durability of agricultural equipment, machinery, and implements and speeding up the use of the achievements of laser technology in agriculture adopted Decree-Decision No

59/34 "On the Organization of a Joint Scientific Production Laboratory of Laser Processes on the Basis of Litselkhoztekhnika and the Institute of Physics of the Academy of Sciences."[9] The new laboratory has successfully begun its activity.

During the 11th Five-Year Plan the Academy of Sciences also developed and extended other traditional forms of scientific, scientific and technical, and other cooperation with various organizations and departments.

Successful cooperation with institutes of the USSR Academy of Sciences, central scientific institutions, as well as institutions of many scientific centers of the country was continued, cooperation with higher educational institutions of the republic was developed,[10] and the creative scientific cooperation and socialist competition with the Belorussian SSR Academy of Sciences, which were begun back in 1973, were strengthened (19 institutions of the Belorussian SSR Academy of Sciences and 14 institutions of the Lithuanian SSR Academy of Sciences are already participating in it, there are 9 sections and 196 items in the plan of cooperation with the 12th Five-Year Plan).[11]

In 1985 the Presidium of the Academy of Sciences adopted significant decrees on comprehensive scientific cooperation with the Estonian SSR and Latvian SSR academies of sciences (No 154 of 29 April 1985; cooperation will be carried out in 9 basic directions, more than 20 scientific problems will be worked on),[12] with the Lithuanian SSR Ministry of Agriculture (of 4 September 1985 and No 35/146 of 18 October 1985; 8 institutions of the Academy of Sciences and 6 institutions of the Ministry of Agriculture will jointly conduct research, 6 problems and 27 themes will be worked on),[13] and with the Polish Academy of Sciences (the agreement of 31 October 1985; 10 institutes of the Lithuanian SSR Academy of Sciences and 17 institutes of the Polish Academy of Sciences will jointly study 16 themes).[14]

Steps on the increase of the role of institutes of the Academy of Sciences in the matter of improving this system under the conditions of the implementation of the school reform are envisaged by joint Decision-Decree No 21 of 24 April 1985 of the Presidium of the Academy of Sciences and the Collegium of the Lithuanian SSR State Committee for Vocational and Technical Education.[15]

The results of the basic research of the Academy of Sciences and the introduction of the scientific and technical developments, which were completed on their basis, as well as the scientific organizational activity of the Academy of Sciences made a significant contribution to the development of scientific and technical progress in the republic and of its economy and to sociocultural development.

The achievements of the Academy of Sciences in the areas of scientific and scientific organizational activity and the acceleration of scientific and technical progress during the 11th Five-Year Plan received a high rating.

During the years of the 11th Five-Year Plan 11 staff members of the Academy of Sciences were awarded orders of the USSR, the title of Hero of Socialist Labor was conferred on President of the Academy of Sciences Academician Yu. Pozhela, the honorary titles of honored workers in various fields were conferred on 32 staff members of the Academy of Sciences, 28 workers were awarded Honorary Diplomas of the Presidium of the Lithuanian SSR Supreme Soviet, and 20 workers of the Academy of Sciences were awarded Lithuanian SSR State Prizes.

The Institute of Chemistry and Chemical Technology was the winner in the all-union socialist competition in the area of the natural and technical sciences for 1983. At the All-Union Seminar-Conference on Questions of the Increase of the Efficiency of the Introduction of the Results of Scientific Research (On the Basis of the Example of the Activity of the Institute of Chemistry and Chemical Technology of the Lithuanian SSR Academy of Sciences), which was held on 5-7 March 1984 in Vilnius, the Challenge Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee was solemnly presented to the institute.[16]

For the development and introduction in production of highly efficient technologies of the application of nickel, zinc, conversion, and chrome coatings Academicians Yu. Matulis and R. Vishomirskis, as well as institute staff members P.-R. Dobrovolskis, A. Bodnevas, M. Mitskus, R. Sharmaytis, Yu. Vegis, A. Petrauskas, and S. Yakobson jointly with a group of other scientists and production workers of the republic were awarded the 1984 Prize of the USSR Council of Ministers for the completion of comprehensive scientific research, planning and design, and technological work in the most important directions of the development of the national economy and its sectors.[17]

On 15 March 1985 the USSR State Committee for Science and Technology adopted Decree No 97 "On the Experience of the Work of the Lithuanian SSR Academy of Sciences on the Introduction of the Results of Scientific Research and Development in the National Economy,"[18] in which it noted that the Presidium of the Academy of Sciences with the constant support of the Lithuanian CP Central Committee and the Lithuanian SSR Council of Ministers had formulated and is implementing a set of measures, which are aimed at the assurance of scientific and technical progress, rated highly the practice and experience of comprehensive scientific and technical cooperation between the Academy of Sciences and the city of Shyaulyay and the new forms of cooperation of institutes of the Academy of

Sciences with the institutions of all-union sectorial ministries, which operate in the republic, and on the organization of intersectorial cooperation for the development of the latest equipment and the introduction of the results of scientific research, recommended that the work on the organization of experimental production subdivisions attached to institutes of the Academy of Sciences be continued, and recommended that ministries and departments of the USSR, the academies of sciences and ministries of higher and secondary specialized education of the republics, and the affiliates and scientific centers of the USSR Academy of Sciences use the experience of the Lithuanian SSR Academy of Sciences, which has been gained in the area of the introduction in the national economy of the results of scientific research and development and the solution of problems of a sectorial and intersectorial nature.

Consistently pursuing the policy of the strengthening of the contacts of science with production, the increase of the efficiency of scientific research, and the acceleration of the introduction of its results, the Presidium of the Academy of Sciences adopted on 30 December 1985 Decree No 457 "On the Formation of New Scientific Production Associations and the Development of Existing Ones, Measures on the Introduction of Other Forms of the Integration of Science and Production and the Strengthening of the Material Base of Institutes and Plants," in which it envisaged the establishment of a temporary interdepartmental collective for the solution of a very important national economic problem—the development and introduction of a waste-free technology of electroplating, the development of new and the expansion of existing scientific production associations and scientific production complexes, and other steps on the assurance of the further acceleration of scientific and technical progress and the intensification of the integration of science and production during the years of the 12th Five-Year Plan.[19]

Footnotes

1. See the wordings of the basic directions of scientific research of the Academy of Sciences in the annual descriptions of the activity of the Academy of Sciences, which are published in the journal. See the full wordings of these directions: M. Rimkyavichene, "The Activity of the Lithuanian SSR Academy of Sciences During 1976," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 3(106), 1978, pp 116-118.

2. On the activity of the Academy of Sciences and its institutes during the years of the 10th Five-Year Plan see the annual descriptions of the activity of the Academy of Sciences, which were published in the journal, as well as: Y. Samaytis, V. Petrauskas, and T. Sidorenko, "The Basic Results of the Activity and Development of the Lithuanian SSR Academy of Sciences During the 10th Five-Year Plan (1976-1980)," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 2(129), 1982, pp 78-89.

3. For more detail on the achievements of the Lithuanian SSR Academy of Sciences in various areas of scientific and scientific organizational activity during the years of the 11th Five-Year Plan see the annual descriptions of the activity of the Academy of Sciences, which were published in the following volumes of the journal *Trudy Akademii nauk Litovskoy SSR. Seriya B*: during 1981—Vol 1(134), 1983, pp 104-132, during 1982—Vol 1(140), 1984, pp 103-123, during 1983—Vol 2(147), 1985, pp 103-123, during 1984—Vol 5(150), 1985, pp 100-121, during 1985—Vol 2(159), 1987, pp 127-147, as well as other publications of the journal on the activity of the Lithuanian SSR Academy of Sciences during the years of the 11th Five-Year Plan.

4. See S. Imbrasas, "Didnant mokslininku indeli," *Mokslas ir technika*, No 11(239), 1986, pp 2-5.

5. See A. Ramanauskas and Y. Samaytis, "Elektronika Is the First Scientific Production Complex in the Lithuanian SSR," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 4(131), 1982, pp 129-132.

6. See A. Ramanauskas and V. Petrauskas, "The Strengthening of the Contacts of the Lithuanian SSR Academy of Sciences With Production and the Increase of the Economic Efficiency of the Introduction of the Results of Its Scientific Research During the 11th and 12th Five-Year Plans," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 3(142), 1984, pp 110-126.

7. See R. Yusionis, V. Redaytis, and V. Petrauskas, "The Results of the Comprehensive Scientific and Technical Cooperation Between the Academy of Sciences and the City of Shyaulyay During the 11th Five-Year Plan and Its Program for the 12th Five-Year Plan," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 1(158), 1987, pp 111-116.

8. See footnote 6 of source 1, p 131.

9. See ibid., p 137.

10. See Y. Samaytis and A. Ramanauskas, "The Contribution of the Academy of Sciences and Higher Educational Institutions of the Lithuanian SSR to Scientific and Technical Progress," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 5(132), 1982, pp 102-105, as well as the annual descriptions of the activity of the Academy of Sciences, which were published in the journal (see footnote 3).

11. See L. Bulotas and V. Ulyavichyus, "The Creative Cooperation and Socialist Competition Between the Belorussian SSR and Lithuanian SSR Academies of Sciences During the 11th and 12th Five-Year Plans," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 1(158), 1987, pp 135-138.

12. See Y. Samaytis, "The Cooperation Between the Academies of Sciences of Estonia, Latvia, and Lithuania," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 1(152), 1986, pp 133-135.

13. See Y. Samaytis, V. Petrauskas, and R. Barauskas, "The Prospects of Cooperation Between the Academy of Sciences and the Ministry of Agriculture During the 12th Five-Year Plan," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 3(154), 1986, pp 145-148.

14. See Y. Samaytis, V. Baltushis, and V. Petrauskas, "The Prospects of Cooperation Between the Lithuanian SSR Academy of Sciences and the Polish Academy of Sciences During 1986-1990," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 3(154), 1986, pp 151-154.

15. See Y. Samaytis, "The Academy of Sciences and the Improvement of Vocational and Technical Education," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 1(152), 1986, pp 137-138.

16. See N. Kharitonova, Y. Samaytis, and V. Petrauskas, "Increase the Efficiency of the Introduction of the Results of Scientific Research of Academic Institutes," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 1(146), 1985, pp 140-147; A. Ramanauskas and V. Petrauskas, "The Experience of the Institute of Chemistry and Chemical Technology in the Introduction in Production of the Results of Scientific Research," *Trudy Akademii nauk Litovskoy SSR. Seriya B*, Vol 2(141), 1984, pp 93-100; V. Ramanauskas and J. Salkausjiene, "Isradimu efektyvumas," *Mokslas ir technika*, No 10(328), 1986, pp 36-37.

17. See footnote 16 of source 1, p 146.

18. See footnote 6 of source 1, pp 134-135.

19. See ibid., pp 136-136.

7807

Tables on Scientific and Technical Progress in the UkSSR

18140027 Kiev EKONOMIKA SOVETSKOY UKRAINY No 8, Aug 87 pp 48-52

[Statistical compendium by UkSSR Central Statistical Administration: "Scientific and Technical Progress in the UkSSR"]

[Text] V.I. Lenin wrote: "...in order to build communism, we need to take both technology and science and get them going"[1].

The present stage of economic and social development is characterized by the continuous growth of the role of science in all spheres of public production.

In our republic, a large scientific potential has been created. The number of scientific and scientific pedagogical personnel in 1986 was 210,400 persons while in 1940 the figure was 19,300 persons.

Among scientific personnel in 1986, 76,000 persons, or one out of every three individuals, had higher educational qualifications—an academic degree of doctor or candidate of sciences. In the past 20 years, the number of scientific personnel has more than doubled, while the number of persons with an academic degree of doctor or candidate of sciences has tripled.

More than 42,000 scientific personnel have academic titles. They include 4500 academicians, corresponding members and professors. Women work in the sphere of science. Among scientific personnel of the republic, they comprise 38 percent, 13 percent being doctors and 26 percent candidates of sciences. A total of 504 women had the title of academician, corresponding member or professor.

The 27th CPSU Congress set the task of bringing about an energetic shifting of science to the needs of retooling the national economy, closely linking it to production, using for these ends new forms of integration and interaction that have proved themselves, accelerating the introduction of research results into practice, boosting the payback of academic and sectoral institutes and the scientific potential of VUZs and improving the training of the scientific young generation.

At the end of 1986, the number of mechanized flow automatic lines in industry was 39,000, there were 23,000 integrated mechanized and automated sectors, shops and production operations and more than 40,000 units of programmed control equipment.

In 1986, three scientific discoveries were registered.

Bibliography

1. Lenin, V.I., "Polnoye sobraniye sochineniya" [Complete Works] Vol 40 p 253.

7697

Expansion of Lithuanian Academy's Ties with Production Stressed

18140143a Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B in Russian No 6, Nov-Dec 86 pp 129-139

[Article by A. Ramanauskas and V. Petrauskas: "Strengthening Contacts of Lithuanian SSR Academy of Sciences with Production, Boosting Economic Effectiveness of Introduction of its Scientific Research in the 11th and 12th Five-Year Plans"]

[Text] Implementing the instructions of the party on all-round acceleration of scientific and technical progress, the collective of the Lithuanian SSR Academy of Sciences (AS) is engaged in systematic work on strengthening the ties of science with production and is putting into effect measures for speeding up the introduction of scientific achievements in production and raising the efficiency of scientific-research and introductory work. Constant attention has been paid and is being paid by the Presidium of the Lithuanian SSR Academy of Sciences to this work and its planning, organization and monitoring.[1]

In Decree No 22 of the Presidium of the Lithuanian SSR Academy of Sciences of 27 January 1986 "On Introduction of Results of Scientific Research of the 11th Five-Year Plan and Indicators of Effectiveness for the 12th Five-Year Plan and 1986," it is noted that in the 10th Five-Year Plan (1976-1980) the economic effect from such introduction amounted to 37.4 million rubles and in the 11th Five-Year Plan (1981-1985) it increased to 98.1 million rubles (in 1985—26.4 million rubles), that is 2.6-fold. The prescribed economic-effectiveness targets for the 11th Five-Year Plan by Decree No 167 of the Academy of Sciences of 5 May 1981 "On Boosting the Economic Effect of Introduced Scientific Work" were fulfilled 102 percent.[2]

During the 10th Five-Year Plan, introduction of the results of one work yielded on the average 65,000 rubles of annual economy, during the 11th Five-Year Plan—133,000 rubles, that is, twofold as large and in 1985 even 173,000 rubles. At the Institute of Chemistry and Chemical Technology, the economic effect of one introduced work in 1985 reached 357,000 rubles and was twice as high as the average effect of an introduced work for the entire Academy of Sciences. Indicators for this work improved especially at the Institute of Semiconductor Physics—the number of works introduced during the 11th Five-Year Plan increased 6.6-fold and their effectiveness grew 7.9-fold.

Resolution No 22 of the Presidium of the Academy of Sciences of 27 Jan 1986 obliged institutes to use more quickly and widely research results and for this end to more energetically set up temporary laboratories and units and to better use resources of experimental plants and other units. It approved economic indicators for the introduction of the results of scientific-research work of institutes of the Academy of Sciences for the 11th Five-Year Plan and established minimal economic-effect targets from introduction in the 12th Five-Year Plan and in 1986 (Table 2).

Institutes of the Social Sciences Department have to study more deeply the role of the human factor in boosting intensity of production under conditions of scientific and technical progress and in searches for new methods and measures for expanding the social activity of the masses in all fields of the people's social and economic life.

The institutes were instructed to systematically look for measures and means of introducing results of scientific research which would contribute to the attainment of a stage where the results of scientific research would make it possible to help as quickly and effectively as possible acceleration of intensification of production and reduction of its cost, improvement of the quality of products, economy of materials and power and impovement of dissemination of the results of the most valuable works completed by institutes of the Academy of Sciences.

In a search for new forms of bolstering integration of science and production, the Presidium of the Academy of Sciences gave much consideration to activation and expansion of the work of experimental and production sectors, production facilities and bases already existing at institutes and to the organization of new independent experimental testing plants. During the 11th Five-Year Plan, another 3 such plants were set up in the Academy of Sciences—the Pilot Plant attached to the Institute of Semiconductor Physics, the Pilot Plant of Laser and Electronic Equipment attached to the Physics Institute and also the Experimental Plant of Computerized Units for Instruments and Programs attached to the Institute of Mathematics and Cybernetics (see Table 3).

These units made it possible to increase the responsibility of scientists for concreteness of research results and their usefulness for practical work and speeded up their introduction into production. Thanks to their operation, the volume of cost accounting work at the Academy of Sciences increased—by the end of the 11th Five-Year Plan this work amounted to 50 percent of the total financing of the Academy of Sciences.

The Presidium of the Academy of Sciences generalized these and other positive features of the work of pilot plants of the Academy of Sciences in Resolution No 151 of 24 April 1985 "On the Work of Pilot and Experimental Plants of the Academy of Sciences." Pointing out that with the help of the plants the route of introduction of the results of basic research of the Academy of Sciences into production was shortened, that contacts between scientists and production people became closer and that such a practice was positively rated at a meeting of the Collegium of the USSR State Committee for Science and Technology held 15 March 1985.[3] The Presidium of the Academy of Sciences at the same time pointed out

defects in operation of the plants and unsolved problems of their operation. It proposed as a fundamental work task for the plants "making preliminary models, testing, designing and producing experimental models of devices developed at institutes, their components, technologies and programs" and formed a council of directors of pilot plants of institutes of the Academy of Sciences which would assist to a large extent in coordinating the operation of plants, would encourage cooperation and work among them and improve the organization of their work.

At the Academy, searches for ways of strengthening the contacts of science with production and their integration continued further. For the purpose of improving the embryonic scientific and technical cooperation between the Academy of Sciences and the city of Shyaulyay, the Presidium of the Academy of Sciences, the Shyaulyay City Committee of the Communist Party of Lithuania, the Shyaulyay executive committee of the city's Soviet of People's Deputies and the Party Committee of the Academy of Sciences adopted on 13 November 1980 a general decisison No 50/47 "On a Comprehensive Program of Scientific and Technical Cooperation between the Academy of Sciences and the city of Shyaulyay for 1981-1985." With the enactment of this program, starting in 1981 planned comprehensive scientific and technical cooperation began between the Academy of Sciences and the city of Shyaulyay.[4]

During the 11th Five-Year Plan, more than 50 laboratories and departments of almost all of the institute's of the Academy of Sciences studied more than 140 themes solving different topical technical, economic and social problems of production organizations and the city economy of Shyalyay. Through the united efforts of the institutes of the Academy of Sciences and collectives of the city of Shyalyay, the introduction of the results of this research in the city of Shyalyay provided one-third of the economic effect obtained from the realization in the city of measures for the introduction of new equipment. This work is being continued in the 12th Five-Year Plan.

But sectoral institutes, numeerous departmental design bureaus and other organizations operating in the republic have not taken part in this work. For many years, the Presidium of the Academy of Sciences was seeking such forms of cooperation with the scientific and technical organizations of their departments that would provide the possibility of combining the interests of academic science, higher educational institutions and sectoral scientific-research institutes and plants.

Inasmuch as in the republic the radioelectronics industry, encompassing such production operations as that of radiation measuring instruments, semiconductor instrments and the like, has been developed and basic reseaarch on physical phenomena in semiconductors is being conducted in institutes of the Academy of Sciences, and new semiconductor instruments and radioelelctronic apparatus are being develooped on the basis of the results of this research, the idea came to mind to create an interdepartment scientific-production complex (NPK) which would help all interested organizations and enterprises of this filed to considerably more successfully solve practical paroblems. Such a scientific-production complex—Elektronika—was created in 1981.[5]

In the first 3 years of its existence the Elektronika Scientific-Production Complex achieved good results in the field of creation of semiconductor, radioelectronic and microprocessor instruments as well as automation of production processes and improvement of production quality in other fields.

For the Panyavezhis Ekrana Plant, a system of information gathering on production quality consisting of 16 moveable consoles and displays for the foreman and interface, making it possible to transmit information to the plant's computer center was worked out and introduced in it. Production quality was improved and labor outlays were reduced.

For the Shyaulyay Television Plant, a microprocessor system of diagnostic control over printed circuit boards for television sets was developed and being tested in it. With the comon resources of the partners of the scientific-production complex, production was started of 6 automated system for control over installation of board.

Much work is being done on the creation and introduction of a system of automated designing/planning of radio/ation measuring equipment (SAPR). Accomplishment of the first stage of SAPAR of printed circuit boards made it possible to speed up planning/design work and to improve the quality of products and their technical level. This collective work was marked by the Lithuanian SSR State Prize in the Field of Science and Technology for 1985.

In the Elektronika complex, there work 17 partners who in the years of the 11th Five-Year Plan introduced about 40 works and produced an annual economic effect of a sum of more than 5 million rubles.

Beginning in 1984, the Elektronika Scientific-Production Complex has been compiling concrete work plans in which are specified themes subject to solution, their executants, pefromance time periods, cost of the work and anticipated economic effect. Each year work is being expanded on performance of the program "Raising the Technical Level, Qualiaty and Reliability of Televisions Made in the Lithuanian SSR." in the program "Semiconductors-66" provision is made for 1986-1990 to perform designand research work for a sum of 15.1 million rubles and by introducing their results to get an economic effect of 25-30 million rubles, that is, four- to fivefold more than in the 11th Five-Year Plan. Moreover, it is planned to release 500 workers for other work as the result of production rationalization.

Taking into consideration the successful work of the Elektronika Scientific-Production Complex, the Presidium of the Academy of Sciences adopted on 27 June 1983 Decree No 181 "On Organization of Scientific-Production Complexes and Associations" in which it provided for the creation of another two scientific-production associations (NPO)—Galvanotekhnika and Lazery.

On the basis of Decree No 323 of the Central Committee of the Communist Party of Lithuania and the Lithuanian Council of Ministers of 10 November 1982 "On Increasing the Effectiveness of Scientific Research and Intensifying the Role of Science in Acceleration of Scientific and Technical Progress in the Republic's Economy in the Light of the Decisions of the 26th CPSU Congress,"[6] the Presidium of the Academy of Sciences adopted on 21 May 1984 Resolution No 151 "On the Organization of the Lazery Scientific-Production Association."

The decree approves the proposals of the bureau of the Department of Physico-Technical and Mathematical Sciences of the Academy of Sciences to set up the Lazery Scientific-Production Association, which would operate as a public service. It would include 19 scientific-production organizations and enterprises under the scientific supervision of the Physics Institute of the Academy of Sciences. It was determined that the Lazery Scientific-Production Association should function guided by the republic's technical program and solve the following basic problems: (a) development and introduction of effective methods of laser treatment of materials, (b) development and introduction of laser machines and automatic laser technological systems, (c) development and introduction of industrial laser methods of diagnostics, (d) development and production of equipment for laser systems. The draft of a temporary statute on the operation of the Lazery Scientific-Production Association was approved.

The creative scientific oooperation and socialist competition between the academies of sciences of Lithuanian SSR and Belorussian SSR, initiated in 1973, ever developing in breadth and expanding in depth, which received a high rating in the newspaper PRAVDA,[7] have greatly contributed to improvement in the use of the scientific potential of the Academy of Sciences with its experimental bases and acceleration of scientific and technical progress. This cooperation encompasses the majority of the scientific institutions of both academies. It has adopted a permanent planned character—annual contracts and agreements are concluded between the two academies and their institutes and 5-year perspectives of joint work and measures are designated, and the results of the cooperation are systematically discussed and generalized. Together scientific research is performed, scientific conferences and expeditions are conducted, publications are prepared and issued, qualified personnel are trained and so on. For example, during the years of the 11th Five-Year Plan, the collectives of both academies worked on more than 40 important scientific themes.[8]

The work of the Lithuanian SSR Academy of Sciences in the area of strengthening contacts of science with production and integrating science and production and the acquired experience of this work[9] have been recognized on an all-union basis.

On 5-7 March 1984 the All-Union Seminar-Conference on Questions of Increasing the Effectiveness of Introducing Results of Research was held in Vilnius (on the example of the work of the Institute of Chemistry and Chemical Technology of the Lithuanian SSR Academy of Sciences). It called together the Council for Coordination of the Scientific Activity of the Academies of Sciences of Union Republics attached to the Presidium of the USSR Academy of Sciences, the Presidium of the Lithuanian SSR Academy of Sciences and the Central Committee of the Trade Union of Workers of Education, Higher Educational Institutions and Scientific Institutions of the Country.[10] The conference approved the work of the Academy of Sciences in this field and recommended the dissemination of this experience among the academies of sciences of other republics. The work of the conference and its materials were published in the organ of the Presidium of the USSR Academy of Sciences the journal VESTNIK AKADEMII NAUK SSSR.[11]

On 15 March 1985, the USSR State Committee for Science and Technology, on listening at a meeting of the collegium to reports of the president of the Lithuanian SSR Academy of Sciences and the first secretary of the Shyaulyay city committee of the Communist Party of Lithuania on achievements in integration of science and production in the republic and in Shyaulyay, enacted Decree No 97 "On the Work Experience of the Lithuanian SSR Academy of Sciences on Introducing the Results of Scientific Research and Development in the Economy." It is pointed out in the decree[12] that the Presidium of the Lithuanian SSR Academy of Sciences with the constant support of the Central Committee of the Communist Party of Lithuania and the Lithuanian SSR Council of Ministers has worked out and is implementing a complex of measures aimed at ensuring scientific and technical progress in the republic. The success of this work and the reliable base for applied work in the republic is also due to the circumstance that basic research of a high level is being conducted at institutes of the Lithuanian SSR Academy of Sciences.

Fulfilling the decisions of all-union and republic directive organs, an active search goes on in the republic for new forms of integration of science and production. Good results have been attained in their implementation. The practical experience of integrated scientific and technical cooperation between academic institutes and production and economic organizations of the city of Shyaulyay deserves a great deal of consideration.

As a consequence of fulfillment of planned measures for acceleration of integration of science and production, and also of technical progress, the annual economic

effect from introduction of research results of the Lithuanian SSR Academy of Sciences, amounting in 1979 to 7.9 million rubles, grew in 1983 to 20.9 million rubles, that is, it increased 2.6-fold.

The committee's decree positively rates the experience of the work which the Lithuanian SSR Academy of Sciences has been performing together with party and soviet organs of the republic and all-union sectoral ministries relating to finding new forms of strengthening the ties of science and production and also relating to coordination of scientific and technical cooperation between academic institutes, VUZ's and industrial enterprises of the republic with the active participation of local soviet organs.

The committee pointed out the work conducted in the republic on creating and organizing production of new equipment and also work on using various forms of intersectoral cooperation in the solution of questions of automation of production.

The committee endorsed the efforts of the Institute of Chemistry and Chemical Technology of the Lithuanian SSR Academy of Sciences on strengthening contacts with production, especially the practice of selecting priority themes, taking into account the requirements of industrial enterprises and production associations and also the practice of bringing completed developments up to introduction into production, cooperating in this with head sectoral organizations and base enerprises.

It was recommended to the Presidium of the Lithuanian SSR Academy of Sciences to continue work on setting up experimental production units at institutes of the physics and technical type and pilot production sectors at institutes of the chemical and biological type, to establish at the Institute of Mathematics and Cybernetics an experimental production unit for developing programs for computers and to create an academic general special design and technological bureau with experimental production.

It was recommended to USSR ministries and departments, academies of union republics and ministries of higher and secondary specialized education of union republics, affiliates and scientific centers of the USSR Academy of Sciences to utilize the experience of the Lithuanian SSR Academy of Sciences on introducing the results of scientific research and development into the economy and solving problems of a sectoral and intersectoral character.

New major and concrete tasks in the field of development of integration of science and production, creation of scientific-production associations and raising the efficiency of their work rose before the Academy of Sciences with the enactment of Decree No 212 of 29 July 1985 of the Central Committee of the Communist Party of Lithuania and the Lithuanian Council of Ministers "On the Formation of Interdepartmental Scientific-Production Associations."[13]

For the purpose of further bolstering the effectiveness of scientific research, speeding up the introduction of scientific and technical developments into practice by means of strengtheening the contacts of science and production while taking into account the positive work experience of intersectoral scientific-production associations and complexes—it states in the decree—the Central Committee of the Communist Party of Lithuania and the Lithuanian Council of Ministers approved the proposal of the Presidium of the Academy of Sciences and the Lithuanian SSR Ministry of Higher and Secondary Specialized Education to organize in the republic the interdepartmental Lazery and Galvanotekhnika scientific-production associations whose operation must be based on integrated scientific and technical programs (coordination plans).

It was recommended to ministries, departments, production associations and enterprises to ensure wide-scale use of the achievements of interdepartmental scientific-production associations for putting out new kinds of products and developing a more advanced technology and measures for automation of production.

The Model Statute of the Interdepartmental Scientific-Production Association Operating as a Public Service was enacted.

On 5 August 1985, the Presidium of the Academy of Sciences adopted Resolution No 268 "On the Lazery Scientific-Production Association and the Galvanotekhnika Scientific-Production Association," which obliged institutes of the Five-Year Plan to consider Decree 212 of 20 November 1985 "On Formation of Interdepartmental Scientific-Production Associations" of the Central Committee of the Communist Party of Lithuania and the Lithuanian SSR Council of Ministers "On Formation of Interdepartmental Scientific-Production Associations" a program document and instructed institutions, institutes and departments of the Presidium of the Academy of Sciences to be guided by it. It ordered the Physics Institute and the Institute of Chemistry and Chemical Technology to work out work programs (comprehensive plans) for the said associations for the period of the 12th Five-Year Plan.

On the basis of the model statute for scientific-production associations, the statutes on the Lazery Scientific-Production Association and the Galvanotekhnika Scientific-Production Association were prepared and enacted.

The Physics Institute of the Academy of Sciences was established as the main scientific organization of the Lazery Scientific-Production Association.

This scientific-production association includes the following organizations: Institute of Semiconductor Physics of the Academy of Sciences, Vilnius University imeni Kapsukas, Ultrasound Laboratory imeni K. Barshauskas of the Kaunas Polytechnic Institute imeni Antanas Snechkus, Vilnius Engineering Construction Institute, Vilnius Scientific-Research Institute of Radiation Measuring Instruments, Orgtekhstroy Planning Technological Trust of the Ministry of Construction, Vilnius Furniture Combine, Venta Scientific-Research Institute, Shyaulyay Television Plant, Ukmerge Venibe Plant, Lithuanian Neris Production Association, Vilnius Division of the All-Union Planning-Design and Technological Scientific-Research Institute of Small Electric Machines and Vilnius Sigma Production Association.

The chief directions of the association's work are the following: development and introduction of very effective laser technology, laser equipment and diagnostics methods.

L. Maksimovas, chief of the Department of Industry of the Central Committee of the Communist Party of Lithuania, was made council chairman at the Lazery Scientific-Production Association.

The Institute of Chemistry and Chemical Technology of the Academy of Sciences was made the chief scientific organization of the Galvanotekhnika Scientific-Production Association.[14]

This scientific-production association includes the following organizations: Lithuanian Scientific-Production Association for Planning of Machine-Tool Building Plants, 2nd Pilot Production Subdivision of the Experimental Plant of the State Scientific-Research Institute of the Paint and Varnish Industry, Vilnius Sigma Production Association, Shyaulay Vayras Bicycle Plant and the Panyavezhis Metalitas Production Association.

The association's most important directions of work are the following: development and introduction of low-waste galvanic processes, development of flexible automated galvanic production lines, robotization of galvanic equipment, providing for decontamination of sewage by galvanotechnical processes and utilizing the waste from such processes.

Deputy Chairman of the Lithuanian SSR Council of Ministers Yu. Rusenko was made chairman of the council of the Galvanotekhnika Scientific-Production Association.

It is contemplated that with the development of interdepartmental scientific-production associations their councils could also include in the associations other scientific-research institutions, planning and design organizations, production associations and enterprises.

On 30 December 1985, the Presidium of the Academy of Sciences enacted Resolution No 457 "On the Formation of New Scientific-Production Associations and the Development of Existing Ones and Measures for the Introduction of Other Forms of Integration of Science and Production and Strengthening of the Material Base of Institutes and Plants."

It is pointed out in the resolution that institutes of the Academy of Sciences have done a great deal of work on fulfillment of the plan of measures for ensuring the accomplishment of tasks set by the conference at the CPSU Central Committee on questions of acceleration of scientific and technical progress (11-12 June 1985) approved by Resolution No 267 of the Presidium of the Lithuanian SSR Academy of Sciences "On Measures of the Academy of Sciences for Acceleration of Scientific and Technical Progress" of 5 July 1985 and the resolution of the meeting of the Republic Party Economic Aktiv of 5 July 1985.

Institutes of the Academy of Sciences cooperate with other scientific institutions and production organizations for the purpose of improving effectiveness of research and accelerating the introduction of research results into the economy.

The Elektronika Scientific-Production Complex has launched work on a broad scale and attained good reults. Four institutes of the Academy of Sciences are taking part in the work of the Pretsizionnaya Vibromekhanika [Precision Vibromechanics] Scientific-Production Association, organized in 1981 on the initiative of the Lithuanian SSR Ministry of Higher and Secondary Specialized Education.

Scientific-production laboratories jointly with enterprises of the Institute of Chemistry and Chemical Technology and the Institute of Semiconductor Physics are operating successfully.

For the purpose increasing the durability of agricultural equipment, machines and tools and accelerating the use of achievements of laser technology in agriculture, the Lithuanian SSR State Committee for Production and Technical Support of Agriculture (Litselkhoztekhnika) and the Presidium of the Lithuanian SSR Academy of Sciences created a joint scientific-production laboratory of laser processes by means of Resolution-Decision No 59/34 of 5 Aug 1985 "On the Organization of a Joint Scientific-Production Laboratory of Laser Processes at Litselkhoztekhnika and the Physics Institute of the Academy of Sciences."

Proposals have been worked out and arrangements made for creating a special temporary collective under the supervision of the Institute of Chemistry and Chemical Technology and for uniting specialists of different

departments whose purpose would be the solution of an important economic problem—the development and introduction of a waste-free technology of galvanic production.

Pilot plants of the Institute of Semiconductor Physics, the Physics Institute and the Institute of Mathematics and Cybernetics are successfully being used for speeding up the introduction of results of scientific research, although the question of quarters for the last two has not been resolved.

The Presidium of the Academy of Sciences approved a list of measures for the organization of new scientific-production associations and scientific-production complexes and the development of existing ones during 1986-1990 and a list of measures for the introduction of other forms of integration of science and production and the development of a material base for institutes and plants and other organizational measures.

The Presidium of the Academy of Sciences instructed divisions of sciences and heads of institutes in implementation of the recommneded measures to look for additional reserves for the purpose of ensuring science's contribution to acceleration of technical progress of the economy for 1986-1990 and for the period to the year 2000. Heads of institutes are instructed to develop other measures for speeding up the integration of science and production not provided in the given resolution, to discuss them at scientific conferences of institutes, to coordinate for bureaus of divisions of the sciences and to present them to the Presidium of the Academy of Sciences.

New and more complex tasks of even greater scope facing the collective of the Lithuanian Academy of Sciences are being brought up with respect to fulfillment of the decisions of the CPSU 27th Congress. They were examined at the session of 23 April 1986 of the General Meeting of the Lithuanian Academy of Sciences devoted to a discussion of the tasks brought up for science by the 27th CPSU Congress and the 19th Congress of the Communist Party of Lithuania.[16] The measures which the Academy of Sciences is undertaking for further strengthening the integration of science and production were described in the report of delegate of the 27th CPSU Congress President of the Lithuanian SSR Academy of Sciences Academician Yu. Pozhela and in the resolution adopted by the session of the General Meeting.

Footnotes

1. See: Ramanauskas, A., Petrauskas V. and Redaytis, V., "Strengthening the Ties of the Lithuanian SSR Academy of Sciences with Production and Accelerating the Introduction of the Results of Scientific Research of its Institutes into Practice."—TR. AN LiSSR. SER. B, 1984, Vol 3 (142), pp 110-126.

2. See: Ramanauskas, A., Samaytis, Y. and Petrauskas, V., "Growth of the Economic Effect of Introduction During 1971-1985 of the Results of Research Performed at the Lithuanian SSR Academy of Sciences."—TR. AN LiSSR. SER B, 1982, Vol 3 (130), pp 118-125.

3. See: Ramanauskas, A., "Stiprinant mokslo ir gamybos rysius."—LIAUDIES UKIS, 1985, No 9(323), pp 7-9.

4. See: Samaytis, Y. and Shatkauskas, A., "Scientific and Technical Cooperation Between the Academy of Sciences and the City of Shyaulyay (Resume).—TR. AN LiSSR. SER B, 1981, Vol 3 (124), p 166; Petrauskas, V., Redaytis, V. and Skyabene, S., "Further Development of Comprehensive Scientific and Technical Cooperation Between the Academy of Sciences and the City of Shyaulyay.—TR. AN LiSSR. SER. B, 1983, Vol 2 (135), pp 127-130; Samaytis, Y., Ulyavichyus, V. and Petrauskas, V., "Prospects of Comprehensive Scientific and Technical Cooperation Between the Academy of Sciences and the City of Shyaulyay."—TR. AN LiSSR. SER. B, 1983, Vol 2(141), pp 106-112.

5. See: Ramanauskas, A. and Samaytis, Y., "Elektronika—the First Scientific-Production Complex in Lithuanian SSR."—TR. AN LiSSR. SER. B, 1982, Vol 4(131), pp 129-132; Liekis, A., "Naujas impulsas darbui".—MOKSLAS IR TECHNIKA, 1985, No 10(316), pp 24-26.

6. See: "At the Central Committee of the Communist Party of Lithuania and the Lithuanian SSR Council of Ministers."—SOV. LITVA, 21 Nov 1982, No 2690 (11,982), pp 1-2; Samaytis, Y. and Sidorenko, T., "Use the Republic's Scientific Potential Effectively."—TR. AN LiSSR. SER. B, 1983, Vol 5(138), pp 112-118.

7. See: "Cooperation of Scientific Forces" (Editorial).—PRAVDA, 29 Aug 1980, No 242(22,072), p 1; Sidorenko T. and Samaytis, Y., "Joint Expanded Meeting of the Presidiums of the Academies of Sciences of Belorussian SSR and Lithuanian SSR (9 Jan 1979)."—TR. AN LiSSR. SER. B, 1980, Vol 1(116), pp 162-168; Samaytis, Y. and Sidorenko, T., "Joint Expanded Meeting of the Presidiums of the Academies of Sciences of Belorussian SSR and Lithuanian SSR (11 Feb 1981).—TR. AN LiSSR. SER. B, 1982, Vol 2(129), pp 95-99.

8. See: "Cooperation in the Name of Progress."—SOV. LITVA, 26 Apr 1986, No 99(13.012), p 1; "According to the Program of Cooperation (Replies of President of BSSR Academy of Sciences N. Borisevich and President of Lithuanian SSR Academy of Sciences Yu. Pozhela)."—SOV. LITVA, 3 Apr 1986, No 102 (13,015), p 3; Bulotas, L., and Ulyavichyus, V., "Creative Cooperation and Socialist Competition Between the Academies of Sciences of Belorussian SSR and Lithuanian SSR."—TR. AN LiSSR. SER B, 1987, Vol 1(158), pp 123-129.

9. See footnote 1 as well as: Ramanauskas, A. and Petrauskas, V., "Experience of the Institute of Chemistry and Chemical Technology on Introducing into Production Results of Scientific Research.—TR. AN LiSSR. SER. B, 1984, Vol 2(141) 1984, pp 93-100.

10. See: Kharitonova, N., Samaytis, Y. and Petrauskas, V., "Raise the effectiveness of Introducing Results of Scientific Research of Academic Institutes."—TR. AN LiSSR. SER. B, Vol 1(146), 1985, pp 140-147.

11. See: "Raising the Effectiveness of Scientific Research. Seminar-Conference in Vilnius.—VESTNIK AN SSSR, No 9, 1984, pp 29-47.

12. See footnote 3.

13. See: Decree No 212 of the Central Committee of the Communist Party of Lithuania and the Lithuanian Council of Ministers of 29 July 1985 "On the Formation of Interdepartmental Scientific-Production Associations."—VEDOMOSTI VERKHOVNOGO SOVETA I PRAVITELSTVA LITOVSKOY SOVETSKOY SOTSIALISTSICHESKOY RESPUBLIKI, 10 Aug, No 22, 1985, pp 605-610; and also: Brazauskas, A.M., "Effect of Concord."—TRUD., 27 Sept, No 222 (19,669), 1985, p 2; Brazauskas, A.K., "The Energy of Search."—EKONOMICHESKAYA GAZETA, December, No 49 (8,067), 1985, p 5.

14. See: Rusenka, J., "Mokslinis-gamybinis susivienijimas 'Galvanotechnika'"—MOKSLAS IR TECHNIKA, No 1(319), 1986, pp 2-4.

15. See: "Resolution of the Republic Party Economic Aktiv Which Met 5 July 1985. Results of the Conference at the CPSU Central Committee on Questions of Scientific and Technical Progress and Tasks of the Republic Party Organization."—SOV. LITVA, 6 Jul, No 155 (12,768), 1985, pp 1,3.

16. See: Gardauskene, M. and Balkyavichene, O., "Session of the General Meeting of the Lithuanian SSR Academy of Sciences Devoted to a Discussion of Problems Set Forth Before Science by the CPSU 27th Congress and the 19th Congress of the Communist Party of Lithuania (24 Apr 1986)—TR. AN LiSSR. SER. B, Vol 1(158), 1987, pp 135-140.

Abbreviations

akad. - academician, AN - Academy of Sciences, IMK - Institute of Mathematics and Cybernetics, IF - Physics Institute IFP - Institute of Semiconductor Physics, IKhKhT - Institute of Chemistry and Chemical Technology, NII - scientific-research institute, NPK - scientific-production complex, NPO - scientific-production association.

7697

Development of Semiconductor Physics and Chemistry in Moldavian SSR

18140167 Kishinev IZVESTIYA AKADEMII NAUK MOLDAVSKOY SSR: SERIYA FIZIKO-TEKHNICHESKIKH I MATEMATICHESKIKH NAUK in Russian No 3, Sep-Dec 86 pp 17-29

[Article by S.I. Radautsan, O.G. Maksimova and K.G. Nikiforov]

[Text] The article is dedicated to the 25th anniversary of the formation of the Moldavian SSR Academy of Sciences and summarizes the results of development of semiconductor physics and chemistry in the republic. In the new version of the CPSU Program, the modern needs of our society in regard to science are formulated. Among the most important conditions, the need is pointed out here of concentrating personnel and resources on the most promising directions and on the quickest possible realization of scientific ideas and increased effectiveness of applied research and cooperation of academic, VUZ and sectoral science.

Semiconductor research in Moldavia began in 1953 at Kishinev State University, and since 1959 work in this direction has been done at the Moldavian affiliate of the USSR Academy of Sciences. Concurrently with the organization of the republic Academy of Sciences in 1961, the Institute of Physics and Mathematics was created in Kishinev. It included two laboratories of the semiconductor type—semiconductor compounds and low-temperature optics. Later on, the Institute of Applied Physics was organized at this institute. It became the leading establishment for physics research in the republic. It now has in operation in addition to the two mentioned above laboratories dealing with semimetal physics, photoelectric properties of semiconductors, physical kinetics, low-temperature physics and laser research doing work in the field of semiconductor physics and chemistry. Research in this direction is widely conducted at Kishinev State University at the departments of semiconductor physics, optics and spectroscopy, and electronics and in problem laboratories of semiconductor physics and photothermoplastic recording.

In 1954 at the Department of Electrophysics of Kishinev State University, the first graduation of specialists in semiconductor physics took place. In 1964, the Kishinev Polytechnic Institute was organized. Here training of engineers in electronic technology of the semiconductor type began and at the same time scientific-research work developed in the field of physics of semiconductor devices. Today research on semiconductors is being actively pursued at the Kishinev Polytechnic Institute at the departments of physics and semiconductor and microelectronic devices and at the sectoral scientific-research microelectronics laboratory.

For the purpose of speeding up processes of practical use of the results of scientific research, specialized design and technological bureaus of solid-state electronics (attached to the Institute of Applied Physics of the MSSR Academy of Sciences, 1976) and the problem laboratory of photothermoplastic recording (attached to Kishinev State University, 1976) were created and are operating successfully.

Certain work in the field of semiconductor research is also going on at the Department of General Physics of Tiraspol Pedagogic Institute and at the Moldavian division of the All-Union Scientific-Research Institute of Current Sources.

The training of highly qualified specialists is constantly going on by means of postgraduate training at the Institute of Applied Physics, Kishinev State University and Kishinev Pedagogic Institute. Training is widely pursued through special graduate studies at leading scientific centers. Specialized councils for defense of candidates' dissertations operate at the Institute of Applied Physics of the MSSR Academy of Sciences and Kishinev State University. In 1981, a doctoral council for the specialty "Physics of Semiconductors and Dielectrics" was instituted.

In 1977, the republic scientific council on the problem "Physics and Chemistry of Semiconductors" was organized for coordination of experimental research in the field of semiconductors and concentration of efforts of scientists on the most important and promising directions.

It should be noted that from the initial years of development of semiconductor physics and chemistry in Moldavia, the leading Soviet scientists in this field—Academicians Zh.I. Alferov, B.M. Vul, A.V. Novoselova, A.M. Prokhorov, V.M. Tuchkevich, Professors N.A. Goryunova, B.T. Kolomiyets, D.N. Nasledov, A.R. Regel and others—devoted much attention to organizing and carrying out promising research.

At the present time, eight scientific and scientific-production institutions in which a large detachment of scientists and specialists—3 academicians and 2 corresponding members of the MSSR Academy of Sciences, 15 doctors and more than 130 candidates of sciences—are engaged in the work.

In the past 10 years, work on semiconductor physics and chemistry has attained a special momentum. During 1976-1985, the research results of the scientists were generalized in 60 monographs and thematic collections, presented in 2,000 scientific articles and protected by 350 author's certificates for inventions in the USSR and 20 patents in foreign countries. Much of the work was done on orders of sectoral scientific-research institutes and industrial enterprises, and the results of 150 of these studies were introduced into the economy.

In these years, a number of major scientific forums were held in Moldavia, including the International Conference "Amorphous Semiconductors-80," the all-union conferences "Ternary Semiconductors and Their Application" (1976, 1979, 1983), "Further Development of Optoelectronics" (1977), "Physical Bases of Degradation and Reliability of Semiconductor Instruments (1982, 1986), "Indium Phosphide in Semiconductor Electronics" (1985) and the All-Union School for Topical Questions of Semimetal Physics and Narrow-Zone Semiconductors (1981).

During the 1976-1985 period, 7 doctoral and more than 100 candidate dissertations were completed and successfully defended on the basis of the work coordinated by the council.

A.N. Andriyesh, E.K. Arushanov, M.V. Kot (posthumously), I.P. Molodyan, V.P. Mushinskiy, S.I. Radautsan, E.V. Russu, A.V. Simashkevich, V.V. Sobolev, A.Ye. Tsurkan, F.S. Shishiyanu, S.D. Shutov were awarded the Moldavian SSR State Prize in the Field of Science and Technology for 1983 for production, comprehensive research and employment of crystal and amorphous binary semiconductors.

Institute of Applied Physics of the MSSR Academy of Sciences

At the laboratory for semiconductor compounds, work is going on under the supervision of Academician of the MSSR Academy of Sciences S.I. Radautsan on the production and comprehensive investigation of binary and ternary semiconductors.

A semicommercial technology was developed of growing undoped and doped indium phosphide with a broad assortment of parameters in the form of both single crystals and epitaxial layers. Specimens were produced with specific resistivity gr equivalent to 10^6-10^8 Omxcm and mobility gm=(1-2.3x10^3 cm^2/(vxs) at 300 K suitable for use as a material for the creation of devicestructures and active elements of circuits operating at heightened speed.

Single crystals of cadmium phosphide and arsenide with a broad collection of electron concentrations were grown by means of growth methods from a vapor phase in a vacuum and in an atmosphere of inert gas. On cadmium arsenide, a record mobility of carriers of a charge of 26,4000 cm^2/vxs at 300 K was obtained for semiconductor compounds of that type. On the basis of comprehensive research of the influence of temperature, pressure and strong magnetic fields on kinetic effects in cadmium phosphide and arsenide, the parameters of their energy zone structure were determined. For the first time there was found a narrowing of the band of spontaneous luminescence and a discrete retuning of its frequency

within the limits of 2.12-2.17 micrometers with an increase in the degree of its doping by copper, which is promising for the creation of effective sources of coherent infrared radiation.

A laboratory technology was developed of growing single crystals of zinc telluride homogeneous in composition doped by admixtures of the first (Li, Na, K; Cs) and the second (Be, Mg. Cd, Hg) groups of L.I. Mendeleyev's Table of Elements. In crystals doped with lithium, there was discovered the effect of brightening the spectrum in the green region through excitation with laser pulses and nonlinear phototropic filters for recording dynamic holograms as well as light shutters for producing laser pulses of the subnanosecond range.

Epitaxial growing produced heterojunctions between compounds $A^{II}B^{VI}$ and $A^{III}B^{V}$, $A^{II}B^{VI}$ and $A^{II}B^{VI}$, $A^{II}B^{VI}$ and silicon in a quasi-enclosed space. On the tin dioxide-cadmium selenide-zinc telluride thin-film structure, an effect was displayed of switching with remembering, which is promising for the creation of fast counting boosters. It was noted that heterostructures formed by compounds $A^{II}B^{VI}$ and silicon possess heightened photosensitivity due to a big difference in the values of specific resistance and breadth of the forbidden zone of the components forming the junction. On zinc telluride—zinc oxide structures, an injection electroluminscence was found for the first time in the blue region of the spectrum. The possibility was shown of creating on the basis of heterojunctions (cadmium telluride-zinc telluride/indium antimonide (arsenide) solid solutions of analogues of metal-dielectric-semiconductor structures with a low density of surface states at the boundary of the division [razdel] (N_{88} equivalent to 10^{10} cm^{-2} ev^{-1}). On the zinc telluride-indium phosphide structures, an electroluminescent radiation was detected in the green region of the spectrum due to the recombination of charge carriers injected from indium phosphide, and an effect was also established of switching with memory.

The method of chemical transport reactions produced single crystals of ternary zinc and cadmium sulfides of the type $A^{II}B^{III}{}_2C^{VI}{}_4$. In the ZnS-In_2S_3 system the existence was established of ternary semiconductor phases $Zn_mIn_2S_{3+m}$, m = 1,2,3, in which the phenomenon of polytypism [politipizm] was revealed, which is promising for the creation of superlattices on their basis.

X-ray conductivity of cadmium thiogallate was shown. This made it possible to utilize it as an ionizing radiation detector. Comprehensive research was conducted on the optical and photoelectrical properties of the produced materials, which showed their high photosensitivity in the ultraviolate region of the spectrum and a big resistivity to the dark. On the basis of cadmium thiogallate, small-size light detectors were developed and created for the near ultraviolet region of the spectrum used in microelectronic devices for detection of ultraviolet radiation, which were successfully tested and introduced in different fields of science and the national economy.

By methods of chemical transport reactions, single crystals of magnetic semiconductors $CdCr_2Se_4$, possessing a low density of dislocations (10^2 cm^{-2}) with record narrow lines of ferromagnetic resonance (1.6-2.1 E) were produced from the solution in a molten state. The region of occurrence was determined of ferromagnetic spinels among the compounds formed by anion substitution of copper selenochromite. The influence of doping on the microhardness and density of dislocations in cadmium selenochromite was studied. The possibility was found of control by sign and quantity of conductivity of strongly compensated crystals of such compounds by means of special thermal treatment. For the first time, the coexistence of chromium ions of reduced and increased valence (Cr^{2+} and Cr^{4+}) was found for compounds of this class in cadmium sulfochromite, and conditions were determined of combining semiconductor properties and high (above room) temperature of the magnetic phase transition in the copper selenochromite with anion substitution for bromium. In cadium sulfochromite and selenochromite single crystals, magnetic dependent effects of switching were determined and mechanisms of their occurrence and conditions of combination with magnetic phase transition were studied. The influence of superhigh frequency conductivity on processes of ferromagnetic relaxation in mercury selenochromite and solid solutions on the basis of copper selenochromite was disclosed.

$SnMo_6S_8$ single crystals were produced with the method of gas transport reactions in a gallium atmosphere. Values were determined of the basic electrophysical parameters: the temperature of transition into a superconductive state (T_c=11.5-11.8 K), relative resistivity ($gr_{300\ K}$=2.4-2.6x10^{-4}Om x cm), the gradient of temperature dependence of the upper critical field Nc_2/dT=45.9-47.7 kE/K). Specimens were obtained of ternary molybdenum chalcogenides $PbMo_6S_8$ and $SnMo_6S_8$ in the form of coats on the surface of the molybdenum wire and tape [lenta] with the values of a superconductive transition (T_c=14.8 K for $PbMo_6S_8$ and 14.3 K for $SnMo_6S_8$), the biggest for comparable specimens according to the literature data.

In 1980, a group of young scientists from the laboratory was singled out for the Prize of Komsomol of Moldavia imeni B. Glavan for a series of works on the production, comprehensive investigation and employment of magnetic semiconductor compounds and in 1985, it was awarded the Challenge Red Banner of the Komsomol Central Committee and inscribed in the Golden Book of Honor of the Komsomol Central Committee.

The department of physics of semimetals and low temperatures under the supervision of Academician of the MSSR Academy of Sciences D.V. Gitsu is engaged in the development of investigations of solids at low and extra low temperatures and the development of highly sensitive devices.

A phenomenological and microscopic theory was developed of phenomena of transport in semimetals of the bismuth type in the case of classical magnetic fields.

Systematic research was conducted of anisotropy of kinetic effects in semimetals of the group and their alloys at various temperatures in stationary (up to 18 Tl) and pulsed (up to 40 Tl) magnetic fields. The energy spectrum was studied in details of bismuth-antimony and anitimony-arsenic alloys with the help of quantum oscillation effects. "Gigantic" in amplitude quantum oscillations of magnetothermoelectric motive forces and the areas of observation of this effect were established as to temperature, magnetic field and concentration of components in alloys of semimetals. The special features were studied of anisotropy phenomena of transport in bismusth-antimony alloys in phase electron transitions semiconductor-semimetal in ultraquantum magnetic fields.

A method was developed of studying the behavior of nonisoelectron impurities in weakly degenerated systems, and the existence was shown of small-radius states for which the mechanism of contact with zone states significantly utilizes local disturbances of the symmetry of the introduced impurity. It was established that the character of behavior of the effectiveness of impurities on the degree of doping and temperature in semimetals differs from that in semiconductors.

A theory was developed of the electron energy spectrum of complex narrow-zone semiconductors $A^{III}B^{V}C^{VI}_2$ and hard solutions on their basis. A new group of solid solutions was predicted whose energy spectrum would be characterized by transfer through a slitless condition, the phenomenon of binary inversion of the zone spectrum and the existence of a semimetal two-dimensional state in inverse contacts on the basis of $TlBi_xSb_xC^{VI}_2$.

Single crystals of compounds of the type $TlB^{V}C^{VI}_2$ were produced by the method of zone recrystallization. Phase interactions were studied and diagrams were constructed of the condition of alloys of sections $TlSbSe_2$-lead selenide and $TlBiTe_2$-lead telluride. Galvano- and thermomagnetic characteristics of the $TlB^{V}C^{VI}_2$ group were studied and the basic parameters of the charge carriers were determined. On the basis of $TlSbSe_2$ crystals, a quick-response photoresistor of the visible range for recording pulse laser radiation in the region of the spectrum of 400-700 nm with a depletion time of not more than 10^{-8} sec.

On the basis of the low-temperature thermoelectric materials—bismuth and antimony chalcogenides, micro coolers were developed intended for cooling and thermostating objects in a broad range of temperature (from +60 to -50 degrees centigrade).

Th Ulitovskiy continuous casting method produced thin (a diameter of up to 0.1 micrometer) threads of semimetals and narrow-zone semiconductors. The possibility was shown of increasing the degree of homogeneity of the threads of bismuth-antimony alloys by multiple zone recrystallization.

The dependence of kinetic coefficients on the diameter of the vein in the thinnest possible threads was found, when the thickness of a specimen becomes comparable to the length of a free run of charge carriers (the size effect). A number of size quantum effects were discovered on the thin threads, including new types of resistivity oscillations in a magnetic field, fading with its growth. Direct observation was carried out of the effect of increasing electrons and holes of nonequilibrium phonons in the compensated material. Strong nonlinearities were disclosed caused by the "cherenkovskiy" generation of phonons.

A heating analogue was observed of Josephson's effect, accompanied by superlow frequency generation of electromagnetic radiation, and on its basis a low-temperature radio-engineering device was proposed. Superconducting detectors of infrared radiation were created.

A model of the unit was developed and made on the basis of a gigawatt frequency modified picosecond laser intended for the excitation and recording of spatial [obyemnyy) biofluorescence in the spectral range of 1.06-0.25 micrometers.

Fast-response thermoelectric transformers were fabricated for measuring gas pressure and for nonselective recording of radiation. There were developed a design of a temperature gauge whose sensing element was produced on the basis of an antimony microwire, a gauge for recording atomic oxygen and ozone and others. Parameters of thermoelectric devices of different types were calculated and optimized in the range of temperatures of 4.2-300 K.

In 1982, a group of young scientists from the laboratory was awarded the Prize of Komsomol of Moldavia imeni B. Glavan for work on the study of electron phenomena at low temperatures.

In the low-temperature optics laboratory, the optical properties of solid bodies (semiconductors, dielectrics, semimetals, crystals and glass) are being investigated in a broad energy range from 1 to 10 electronvolts under the supervision of Professor V.V. Sobolev.

For the first time, precision spectra were studied of reflection of single crystals of the groups A^{IV}, $A^{III}B^{V}$, $A^{II}B^{VI}$, $A^{IV}B^{VI}$, $A^{III}B^{VI}$, $A^{II}B^{V}$, $A^{III}_2B^{VI}_3$, $A^{II}B^{IV}C^{V}_2$ and SbSl. Measurements were performed on the orginal automatic units with recording reproducibility of the coefficient of reflection (about 0.03 percent), exceeding by approximately one order of magnitude of the reproducibility of known comparable units in the country and

abroad. The precision of measurements made it possible to disclose a significantly more complex structure of reflection spectra than was known; as a rule instead of 5-7 spikes, two- to threefold more were established. The employment of the high resolving spectral capacity of the units made it possible to determine the polarizatioin and energy of parts of spectra and the complex thin structure of excitons and exciton-extrinsic complexes.

On the basis of precision reflection spectra, reflections and correlations of Kramers-Kronig full complexes of optical basic functions were computed in a broad area of energy and in polarized light for 80 and 295 K: the dielectric function, indicators of absorption and refraction, the function of characteristic losses of electrons, the effective number of valent electrons participating in transitions, electrooptical differential functionss and others.

Experimental and reference spectra contain the fullest and most accurate information on the special features of intrinsic interzone and exciton transitions of emitted compounds in a broad area of fundnamental absorption.

The obtained results provide a reliable basis for developing a theory of zones and excitons of many isotropic and very anisotropic binary and ternary compounds, determining many parameters of instruments and devices on their basis, developing precision noncontact fast methods of quality determination, their perfection and the composition of solid solutions on their basis.

In the laboratory of photoelectric properties of semiconductors, chalcogenide glassy semiconductors are being studied under the supervision of Academician of the MSSR Academy of Sciences A.M. Andriyesh.

The existence in the forbidden zone was disclosed of glassy arsenic sulfide of several groups of local conditions with quasicontinuous distribution on the basis of energies, causing a strong dispersion of charge transfer.

The basic features of electrophysical and optical properties of alloys in arsenic sulfide-antimony sulfide and arsenic sulfide—germanium systems were determined. The possibility was shown of changing the energy distribution of localized states by means of a variation in glass composition. Intermediate compositions of the said systems are characterized by higher photosensitivity and thermal stability compared to arsenic sulfide, which is promising for the creation of recording mediums of optical information on the basis of charge accumulation.

Heterojunctions were obtained on the basis of silicon and glassy materials of the arsenic sulfide-germanium system as well as a number of retrostructures possessing the effect of injection sensitization of the transport layer from the chalcogenide glassy semiconductor for use in recording systems of optical information. A sharp increase in the mobility of charge carriers was observed with injection through the silicon-arsenic sulfide heterojunction or in light injection through a change in the degree of filling traps within the forbidden zone of nonequilibrium carriers.

Planar and drawn fiber light guides of chalcogenide glassy materials were produced and their waveguide characteristics were investigated. The possibility was shown of controlling the optical properties of the waveguide by the employment of light refraction. A light induced change in the radial profile of the refraction indicator in the fiber was obtained. The effect of light induced optical absorption in fibers in the region of tranparency was disclosed and studied. The indicated phenomena were recommended for the creation of different functional elements for devices of laser communication lines.

On the basis of chalcogenide glassy semiconductors, gauges were developed that are being used in agrobiological research, for measuring humidity, intensity of photosynthetically active radiation as well as a microphotoresistor and a photocell for the measurement of the leaf area of plants.

In the laser research laboratory, work was conducted under the supervision of Doctor of Physico-Mathematical Sciences S.L. Pyshkin on investigation of luminescence of semiconductors as well as laser technology for producing various types of microelectronic devices.

Competing multiquantum junctions in semiconductors, phase transitions in the system of bound excitons and biexcitons of high density were found and studied. A series of works was done on the technology of synthesis and production of single crystals of gallium phosphide.

An analyzer of fast flowing processes was developed and made. It was used in research and optimization of erosion laser plasma from semiconductor targets.

The Republic's VUZ's

At the department and the laboratory of semiconductor physics of Kishinev State University imeni V.I. Lenin, they are engaged under the supervision of Professor A.V. Simashkevich in the production of and research on single crystals and thin layers of compounds of group $A^{II}B^{VI}$ and hard solutions as well as heterostructures on the basis of these compounds.

Comprehensive research was conducted on electron and radiation processes in single crystals and n-ZnSe thin layers in a broad range of temperatures (16-300 K) and magnetic fields (up to 46 kE).

Mechanisms of conductivity relative to impurities were studied. It was shown that in moderately doped crystals n-ZnSe (N_D greater than or equal to $3x10^{3x10^{16}}$ cm^{-3} the wave functions of extrinsic atoms, overlapping, form the extrinsic zone. With growth of N_D, the extrinsic zone,

remaining relatively narrow, draws nearer to the conductivity zone and when N_D is greater than $5x10^{17}$ cm^{-3} merges with it. When N_D is greater than 10^{16} cm^{-3}, overlapping of the wave functions with extrinsic states becomes exponentially small. Conductivity for impurities occurs through a tunnel crossing of electrons from one donor to another, that is, it is of a jumping character.

A detailed investigation was carried out of the mechanisms of electron scattering in N-ZnSe. The influence of concentration of electrons and the of degree of compensation on the mobility of carriers of the current was studied. It was shown that the presence of a casual extrinsic [primesnyy] potential in strongly doped compensated crystals (SLK) results in a sharp reduction of mobility due to the special features of conductivity in such a system.

In a broad range of temperatures (4.2-300 K), spectral photoluminescence (FL) and cathode luminescence (KL) of crystals and layers of n-ZnSe were studied. The nature of high-temperature blue cathode luminescence of n-ZnSe was determined. It was shown that the fundamental mechanism of cathode luminescence in this is a recombinatioin of excitons bound to ionized small donors.

A technology was developed of growing undoped and doped $PbSn_xTe_{i-x}$ crystals with methods of zone recrystallization and zone sublimation, making it possible to produce single crystals with given parameters. The galvanomagnetic, thermomagnetic and photoelectric properties of the grown crystals were investigated. An experimental law of dispersion was established, and the effect of [" (?)] phonon entrainment of charge carriers," "mirroring" ["zerkalizatsiya" of energy spectra of the conductivity zone and the valent zone was revealed. It was shown that with T greater than 20 K, $Pb_{0.75}Sn_{0.25}Te$:In crystals possess high photosensitivity and long lasting relaxation.

Thin-film (of the layer-layer type) heterojunctions zinc telluride-cadmium selenide and zinc selenide and a solid solution between zinc and cadmium tellurides were produced and studied. It was shown that in all the obtained heterojunctions the p-n junction coincides with the phase boundary of the division.

The possibility was found of controlling spectral parameters of heterojunctions for $A^{II}B^{VI}$ by changing the thickness of the components, the degree of their doping, illumination and so forth. Selection of optimal conditions makes it possible to create heterojunctions with equal sensitivity throughout the entire area of the spectrum enclosed between the energies corresponding to the breadths of the forbidden zones of the components.

Together with personnel of the physical kinetics laboratory of the Institute of Applied Physics of the MSSR Academy of Sciences, the possibility was shown for the first time of pulse control of electric parameters of heterostructures with the help of optical quantum generators (through narrowing of the p-n junction for the time of laser pulse operation).

Injection electric luminescence at the formed compounds of $A^{II}B^{VI}$ heterojunctions was disclosed. On this basis, light-emitting diodes were created for different areas of the visible spectrum: red, yellow, green and blue. The promising character proved of using heterojunctions on the basis of $A^{II}B^{VI}$ as cells of solar batteries, that, is direct transformers of solar into electric energy (efficiency of up to 7 percent).

It was demonstrated that heterojunctions zinc telluride-cadmium selenide and zinc telluride-zinc selenide could be used both as a source of light and as photodetectors, that is, they form an optoelectric couple. The presence of coordinated spectral characteristics in fabrication of the light source and detector from one and the same semiconductor material is promising in the sphere of use for optoelectronics and integrated optics.

On the basis of heterojunctions with a nonhomogeneously doped component, optolectronic memory cells were created. They are characterized by the property of additivity and the possibility of recording, storing and erasing data without the use of external voltage [vneshnoye napryazheniye].

The department of optics and spectroscopy of Kishinev State University under the supervision of Professor V.P. Mushinskiy is engaged in research on optical and photoelectrical properties of semiconductors, primarily binary and ternary gallium and indium chalcogenides.

Anisotropy of electrical conductivity in layer crystals [sloistyye kristally] of gallium and indium monochalcogenides was studied. For gallium sulfide, selenide and telluride, conductivities in reciprocally perpendicular crystallographic directions differ on the order of 2,000, 400 and 20 times. The dependence of the parameter of anisotropy on concentration of the impurity was determined and its reduction was shown with temperature growth.

A phenomenon of optical orientation of free excitons in certain layer crystals of the gallium-monoselenide type was discovered. The influence of exciton states on the luminescent characteristics of such compounds and their solid solutions was shown.

Compounds of the type $A^{III}B_2$—gallium and indium sesquichalcogenides—were studied in detail. The significant influence of intrinsic defects of such compounds on their basic physical properties through spreading of the edges of the energy zones was demonstrated. The possibility was proved of the existence of excitons in semiconductors with stoichiometric vacancies. The nonsensitivity of such materials to x-ray radiation was

disclosed, which is promising for the creation on their basis of radiation detectors operating without degradation under conditions of increased radiation.

Spectral and temporal characteristics of the longitudinal photocurrent of crystals and thin layers of gallium sesquiselenide and sesquisulfide, cadmium thiogallate and cadmium selenogallate as well as structures of the the type of MSM [metal-semiconductor-metal), MSDM [metal-semiconductor-dielectric-metal] and MDSDM (metal-dielectric-semiconductor-dielectric-metal were studied. It was shown that thin layers and single crystals of the said gallium halcogenides could be used as photosensitive cells of image converters. Laboratory models of operating converters were made and their parameters were determined. The converters are distinguished from known ones by a broader field of spectral sensitivity and possess great durability, a broader dynamic range and the possibility of operating under dynamic conditions.

A unit was created for nondestructive control of the thickness of dielectric and semiconductor layers, providing an immediate reading of the results of measurement at any point with a high degree of localization (10 micrometers).

The department of electronics and the problem laboratory of photothermoplastic recording at Kishinev State University are conducting work under the supervision of Professor L.M. Panasyuk on creation of new devices for recording optical information on the basis of semiconductor-dielectric systems.

The processes of formation both of latent electrostatic and visible images on semiconductor-thermoplastic systems were theoretically and experimentally investigated. The degree of influence of nonlinear characteristics of conductivity and photosensitivity on photographic parameters of the latent image was established. The existence was shown of electrostatic intensification at the stage of establishment of electrostatic contrast through redistribution of charging currents. A model was proposed of formation of an unstable equilibrium in the system semiconductor—heated thermoplastic. Processes of stoppage of instability were investigated and their characteristic parameters were determined for thermoplastic layers with different rheological properties. A qualitative coincidence was obtained of predicted theories of results with experimental research of the kinetics of charging individual layers of the photothermoplastic carrier as a whole and the kinetics of forming a phase relief at different times of exposition, of the potentials on the corona electrode and of recording temperatures. For the first time, the possibility was experimentally displayed of obtaining both negative and positive rastrirovannyye [(?)] images on one and the same photothermoplastic carrier with the help of variation in the time lag of turning on the exposition in regard to the start of charging.

The influence of technological factors on conductivity, drifting mobility, photosensitivity and optical energy activation in chalcogenide glassy semiconductors was investigated. The influence was shown of technological parameters on the density of traps determining the basic laws of charge transfer in forming electric images in chalcogenide glassy semiconductor-dielectric systems. The influence of impurities on the electrophotographic characteristics of layers of chalcogenide glassy semiconductors was studied and a technology was developed of homogeneous three- and four-component layers on long films. For the first time, technological conditions were developed for semiindustrial production of sharp and varizonnyye [variable zone (?)] heterostructures on long films, making it possible to increase three- to sixfold photographic sensitivity of the photothermoplastic carrier and to expand 1.2- to twofold photographic width and gamma.

Research was conducted on heterostructures designated for recording images in various regions of the spectrum. The possibility was demonstrated for the first time of a shift of spectral sensitivity in the red range in single crystals with the creation of an amorphous layer-crystal heterojunction by means of ion implantation. In heterostructures, n-indium antimonide—p-cadmium telluride was shown and the effect of inversion of the sign of the photoelectromotive force in use of photon energy was explained. For the first time, heterostructures were created of germanium-zinc selenide and indium antimonide-cadmium telluride that were suitable for recording and storing optical information in the visible and infrared regions of the spectrum.

At the department of semiconductor and microelectron devices of Kishinev Polytechnic Institute imeni S. Lazo headed by Professor F.S. Shishiyanu, they are engaged in producing and studying crystals of $A^{II}B^{V}$, $A^{II}B^{V}$, $A^{II}CVI—B^{III}{}_2C^{VI}{}_3$ compounds.

Concentrations, the charge state and the enthalpy of formation of vacancies in semiconductors of the $A^{III}B^{V}$ group were determined. Mechanisms were studied of the interaction of impurities with simultaneous diffusion of deeply imbedded impurities in $A^{III}B^{V}$. The promising character was demonstrated of stabilization of the properties of crystals of this group and device structures on their basis by means of simultaneous diffusion doping with oxygen and an element of the iron group.

The physical bases were investigated of the reliability and degradation of semiconductor devices on the basis of $A^{III}B^{V}$ compounds. It was shown that physical effects due to degradation and reduced reliabillity of the devices are primarily controlled by diffusion processes and for this reason may arise in any thermal treatment of a semiconductor or in local heating as a result of an overload of the device. Practical recommendations were given on improving quality, reducing the dispersion of parameters and increasing the reliability of semiconductor devices.

A unit was developed for automatic recording of profiles of distribution of impurities according to the depth of the crystal, making it possible to exercise control over the position of impurities and vacancies in temperature treatment and degradation.

On the basis of theoretical investigations of processes of dissociative diffusion, ways were determined of optimizing profiles of distribution of impurities in the fabrication of device structures on the basis of gallium arsenide and phosphide. With the help of a computer, calculations were made of concentration profiles and parameters of diffusion required for the selection of optimal conditions of diffusion doping.

Highly effective diffusion light-emitting diodes of a yellow and green glow and diffusion diodes with a p-i-n structure possessing an S-shaped characteristic and the effect of switching emitted light were created.

A method of chemical tranport reactions was used to produce crystals of mercury selenogallate and solid solutions in the mercury selenide-gallium sesquiselenide system. The investigations of electrophysical properties of solid solutions in this system made it possible to determine the composition in the vicinity of mercury selenide in which an inversion of the zone structure takes place. Heterostructures were produced between the silicon and the heterovalent solid solutions cadmium selenide—gallium sesquiselenide. Their photoelectric properties were investigated and it was shown that the predominant mechanism of current transfer is the tunnel-recombination method. The maximum photo response of the heterojunctions is closer to the region of intrinsic absorption of silicon.

The method of gg-modulation spectroscopy was developed and with its aid photoconductivity of semiconductor crystals and the photo response of surface-barrier structures of the type of Shottka diodes on their basis were investigated. Electronic states were studied in crystals of cadmium and zinc diphosphide and gallium phosphide. Their zone structure was pinpointed. Diode structures were produced on crystals of the $A^{II}B^{V}_{2}$ group, in particular cadmium diphosphide, by diffusion doping with mercury and sulfur. It was demonstrated that the intensity of the light response of such a p-n-junction exceeds by one order of magnitude the photo response of the Shottka diode on the same material.

At the sectoral scientific-research laboratory of electronics at Kishinev Polytechnic Institute, work was conducted under the supervision of Docent I.P. Molodyan on producing and studying semiconductor materials and opto- and microelectronic devices on the basis of compounds of the $A^{III}B^{V}$ type.

The method of liquid-phase epitaxy was used in the production of thin films and heterostrctures of $A^{III}B^{V}$ compounds and also of solid solutions on their basis. The influence of the composition of the liquid phase, the growth temperature, rate and temperature range of cooling, type of substrate, form of doping impurity and volume of the solution-melt was studied on the speed of crystallization, morphology of the films and uniformity and perfection of the structure. Perfectly uniform layers of indium phosphide and the solid solutions aluminum arsenide-gallium arsenide and indium antimonide-gallium antimonide were produced.

The method of electroliquid-phase epitaxy with back pressure produced epitaxial layers of gallium phosphide with a relationship of intensities increased by more than one order of magnitude in the luminiscence of the green and red bands, which made it possible to create light-emitting diodes of yellow glow with improved color and a high quantum effectiveness.

Gann's diodes were created on the epitaxial layers of indium phosphide. They possessed reduced noise characteristics and higher efficiency, temperature stability and operating frequency (up to 180 gigahertz). On similar layers, Shottka's diodes were created, possessing high sensitivity with null displacement and, in distinction to surface-barrier structures on silicon and germanium, can operate at cryogenic temperatures.

On the basis of heterostructures in the aluminum arsenide-gallium arsenide system, coordinate sensitive photodetectors were created with constant sensitivity in a broad range of wave lengths and fast speed on the order of $5x10^{-5}$ second. They can find application in automatic systems of photoelectronic tracking and in optoelectronic systems for receipt and processing of information.

Processes of selective growth and pickling in the technology of fabrication of device structures for optical integrated circuits and fiber communication on heterojunctions of the gallium arsenide—aluminum arsenide system were studied and developed. With their use, sources of coherent and spontaneous radiation were developed and fabricated for optical integrated circuits and light-fiber communication. Principles were worked out for creating matrices of optical-channel switches for light-emitting diodes for communication equipment and computers.

For nondisruptive control of the quality of semiconductor materials at different stages of the technological cycle for production of semiconductor products as well as parameters of semiconductor devices and complex integrated circuits, a laser scanning microscope was created without any commercial comparable products either in the USSR or abroad. It has a spacial resolution of 1-2 micrometers and a number of resolving elements in the field of vision of up to $5x10^{4}$ and can operate in a range of wave lengths of 0.44-3.39 micrometers under conditions of photo response or for reflection.

A group of the laboratory's young staff workers in 1980 was awarded the Prize of Komsomol of Moldavia imeni B. Glavan in the field of science and technology for work

on research of technological and physical processes and phenomena in conductors for the purpose of opto- and superhigh frequency electronics and in 1983, the Lenin Komsomol Prize. **At the physics department of Kishinev Agricultural Institute imeni M.V. Frunze,** scientific-research work is being conducted under the supervision of Professor A.G. Cheban in the field of agricultural photo power engineering [fotoenergetika]—the study of methods of direct transformation of solar energy into electric power with the help of semiconductor photoelectric stations. The complex of investigations includes study of the dependence of parameters of photo transformers on external conditions characteristic of the MSSR: solar radiation, humidity and also the influence of the atmosphere and microorganisms. Photosensors are being investigated and developed on various semiconductor structures intended for recording intensity and dose of solar radiation as well as various semiconductor structures for the purpose of creating devices for measuring parameters (spectral characteristics, dose and so forth) of photosynthetic active radiation playing a decisive role in the development and synthesis of biomass.

Sectoral Institutes

At the Moldavian Division of the All-Union Scientific-Research and Planning-Design Institute of Current Sources, scientific-research and experimental-design work is proceeding on the creation of electrogenerating and thermocooling devices based on semicondcutor materials.

A technology was developed of producing laminated single crystals of ternary compounds of the type of $A^{III}B^{V}C^{VI}_2$. Phase equilibriums were studied and diagrams made of the state of sections of ternary thallium—arsenic—chalcogen systems. Together with personnel of the semimetal physics laboratory of the Institute of Semiconductor Physics of the MSSR Academy of Sciences, a diagram was constructed of the state of the $TlSbS_2$-$TlBiS_2$ systems, and slight reciprocal solubility of the examined compounds was found. A comprehensive investigation was conducted of the physico-chemical and electrophysical properties of these single crystals and the $TlSbSe_3$ in a broad range of temperatures and wave lengths.

The floating-zone method was used to grow single crystals of low-temperature thermoelectric materials—sold solutions of bismuth telluride-bismuth selenide and bismuth telluride-antimony telluride with coefficients of thermoelectromotive force of about $2x10^{-4}$ V/K. On their basis, thermoelectric microscopic stages with various stabilization temperatures intended for investigations of the processes of freezing and sublimation drying under a microscope and in transmitted light were created.

Due to the expansion of use of semiconductor devices under rigid temperature conditions, the possibilities were studied of creating power diodes on the basis of broad-zone semiconductor materials for the purpose of increasing the working temperature range. Ways were studied of creating a rectified diode on multilayer epitaxial structures of gallium arsenide combining slight power dissipation with high reverse breakdown voltage (up to 2,000 v). Anomalous photovoltaic and photo magnetic effects in complex semiconductors and the possibilities of utilizing them in device structures were investigated.

In the decisions of the 27th CPSU Conference basic positions were formulated relating to acceleration of scientific and technical progress. Progress will be determined to a significant degree by microelectronic computer technology and instrument making, sectors that are developing most rapidly in the republic.

Within the framework of the problems of the Scientific Council "Semiconductor Physics and Chemistry," scientists and specialists of the MSSR Academy of Sciences, VUZ's and sectoral institutes of the republic will conduct during the 12th Five-Year Plan comprehensive investigations of the physical bases of semiconductor study of materials. These investigations will make it possible to expand the range of physical phenomena embodied in the prnciples of operation of new electronic devices and to disclose new effective technologies and materials for introduction into semiconductor production.

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Efficient Use of Scientific, Technical Potential

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[Article by A.K. Solovyev under the rubric "News Items of Scientific Life": "The Increase of the Efficiency of the Use of the Scientific and Technical Potential"; passages in italics are as published]

[Text] The 2nd All-Union Applied Science Conference on Problems of the Management of Science, at which questions of increasing the efficiency of the use of the scientific and technical potential were examined, was held on 18-20 May 1987 in the Hall of Columns of the USSR House of Unions. Leading scientists from academic institutes, representatives of VUZ science, the academies of sciences of the union republics, and sectorial academies, executives of scientific institutions, ministries and departments, scientific production and production associations, interbranch scientific technical complexes, and planning, technological, and design subdivisions of industry, the nonproduction sphere, and agriculture, and members of the staff of ministries and planning and soviet organs took part in the work of the conference. The work of the conference took place within plenary and section meetings. At the plenary meeting in the Hall of Columns 17 people spoke, about 150 people spoke at the section meetings, in all more than 450 people participated in the discussion of the plenary papers and section reports, as well as the discussion on the draft of the decision.

Deputy Chairman of the USSR State Committee for Science and Technology A.M. Kutepov, who noted the importance of the radical restructuring of science in the accomplishment of the long-range tasks of the acceleration of scientific and technical progress, especially the sharp increase of the efficiency of the use of the scientific and technical potential, addressed the opening speech to those who had gathered. The basic direction of the restructuring of the scientific and technical potential is its concentration in the key directions of the development of production and the creation of the economic prerequisites for the large-scale introduction and use of highly efficient, fundamentally new types of equipment and technology. The leading role in the settlement of these questions belongs to academic science, which has a large scientific and technical reserve. However, its realization in the practice of economic activity is possible only on the condition of the efficient work of the other sector of the sphere of science—the sectorial sector. The speaker directed attention to the fact that the enormous scientific and technical potential of sectorial scientific research institutes and design bureaus as a consequence of the shortcomings of the organization of their activity on the part of ministries and departments and the imperfection of the economic management mechanism in the sphere of science is being used inefficiently. The generalizing indicators, which characterize the influence of the results of scientific and technical activity on production, testify to this. Thus, the rate of reduction of the materials-output and power-output ratios for the national economy in the past 10 years has practically not changed, while that of the metal content has even decreased.

Despite numerous measures on the improvement of the economic mechanism, a number of causes of the lack of conformity of the scientific and technical potential, which has been accumulated in our country, to its return still remain. Thus, in addition to the problems of a general order, which were revealed at the April (1985) and January (1987) CPSU Central Committee Plenums and the 27th CPSU Congress, such as the imperfection of the economic mechanism, violations of the principles of economic interest, and others, there are a number of specific factors that are decreasing the efficiency of the use of all the resources of our science. As M.S. Gorbachev stressed at the January (1987) CPSU Central Committee Plenum, "as before such important questions as the efficient coordination of academic, VUZ, and sectorial science, the integration of the efforts of the natural, technical, and social sciences, the comprehensiveness of the research being conducted, the thoroughness of the posing of basic problems, and the increase of the efficiency of specific developments remain urgent and in many respects not settled." The settlement of the listed questions is possible, on the one hand, by the development of an economic organizational mechanism, which ensures the unity of all the stages of the science-production cycle, and, on the other, by the improvement of the economic financial mechanism, which creates an interest of all the participants in the "science—production" cycle in the end results of activity.

The speakers, who addressed the plenary meetings, noted the special role which the consolidated sector "science and scientific service" is called upon to play in the acceleration of scientific and technical progress. However, for this an integral set of organizational administrative and economic management measures, which ensure the interconnected functioning of all sectors of science, should be formulated. This will make it possible to overcome the dispersal of the accumulated potential and to eliminate the contradictions that still remain between the scientific and technical form and the production form of economic activity.

M.P. Chemodanov (the CPSU Central Committee) focused attention on the necessity of increasing the role of party organs in the supervision of the activity of scientific and technical organizations and on the improvement of the interrelations of party and state organs of the management of scientific and technical progress. The basic task of party supervision of the development of science consists in the orientation of specialists toward the achievement of world priority of the scientific and technical development being performed in creative collectives and the overcoming of narrow departmental interests when solving statewide problems. The need to examine all questions of the

management of scientific and technical activity in close connection with the general economic conditions of the development of the country was stressed.

A wide range of questions of the restructuring of the economic mechanism of the interaction of science with production was examined in the report of A.G. Aganbegyan (the Economics Department of the USSR Academy of Sciences). The peculiarities of the present stage of scientific and technical progress consist in the development and formation of integrated technological systems, which provide each works with an interconnected chain of machines and equipment of new generations. In this connection the development of such organizational management structures in the national economic complex, which encompass both scientific research and production subdivisions, which are aimed at the development and introduction of technological systems of the greatest efficiency, is becoming the main object of integration. The Institute of Electric Welding imeni O. Paton of the Ukrainian SSR Academy of Sciences, the Kriogenmash Scientific Production Association, the All-Union Scientific Research, Planning, and Design Institute of Hydraulic Coal Mining, and others can serve as examples of such organizations.

The changeover to new forms of the interaction of scientific, technical, and production activity is entailing radical changes in the planning and management of scientific and technical progress, which will make it possible to link the production and the scientific and technical components of centralized national economic planning and to connect the increase of the generalizing technical and economic indicators of production with the scientific and technical characteristics of the activity of scientific research institutes and design bureaus.

The reform of investment policy—an important factor of the implementation of scientific and technical achievements in production—and the change of the principles of the financing of scientific and technical organizations by the extension of returnable credit for research and development of new equipment with the subsequent changeover to the self-financing and full cost accounting of scientific research institutes and design bureaus are another unit of the new economic mechanism of the integration of science and production. In turn this entails not only the necessity of improving the pricing of new equipment, but also the development of a system of prices for scientific and technical products.

Individual fundamental principles of the restructuring of the economic mechanism of scientific and technical progress, which were formulated by A.G. Aganbegyan, underwent development in the report of V.P. Groshev (the Moscow Institute of the National Economy imeni V.G. Plekhanov), who directed attention to the fact that the radical acceleration of scientific and technical progress and the revolutionary restructuring of the economic mechanism (including the scientific and technical sphere) do not blend (this is also impossible) with the forms of the interaction of science with production, which have been established in practice. This trend is objective, inasmuch as first of all nearby sources are necessary for the development of the national economy. However, the problem of restructuring does not reduce to the achievement of tactical goals. The strategic goals of restructuring require radical changes in the productive forces of the national economy. At the same time the change of production relations is of a long-term nature. Thus, a significant portion of the new social and personal needs are originating under the influence of gained scientific and technical knowledge.

New economic organizational forms of the interaction of science with production, which would correspond to the qualitative changes in the development of the present economy, are necessary. The complete scientific and technical modernization of the national economic complex on a fundamentally new basis, which corresponds to the highest world achievements, is possible on the basis of a flexible, quickly readjustable structure of the economy of the country. Consequently, the need is arising for the systematic improvement of the organizational forms of the development of basic and applied research and development, which are aimed at the search for and duplication of revolutionary new technologies which are capable of making radical changes in production. A mechanism, which is relatively isolated from the present system of management and is based on full cost accounting, self-support [samookupayemost], and self-financing, is necessary for this. The orientation of scientific and technical development and the flexibility of the structure of the national economic scientific complex require centralized management.

Continuing the discussion of the new forms of management of the development of science and technology, Yu.V. Yakovets (the Academy of the National Economy attached to the USSR Council of Ministers) directed the attention of those who had gathered to the decisive role of interbranch scientific technical complexes (MNTK's) in the efficient use of the scientific and technical potential at the present stage. Under the conditions of interbranch scientific technical complexes it proves possible to speed up drastically the development and assimilation of the highest scientific and technical achievements and to implement the mass production of new, highly efficient generations of equipment. However, an economic mechanism of the functioning of interbranch scientific technical complexes, which would be equal to their revolutionary functions, has still not been developed, which is preventing the concentration of the available resources on the solution of the most important scientific and technical problems, is hindering the creative initiative of collectives, and is decreasing economic interest and the pace of the introduction in practice of scientific and technical achievements.

At present the Academy of the National Economy jointly with the Mekhanobr Interbranch Scientific Technical Complex has prepared proposals on the changeover of

the interbranch scientific technical complex to the system of the comprehensive planning, financing, and stimulation of the development, assimilation, and dissemination of new generations of equipment. The uniting of all the functional stages of the science-production cycle—from basic research to the production of the optimum amount of new equipment—is the goal of comprehensive planning.

The orientation of the system of comprehensive generalizing indicators of scientific and technical progress, as V.V. Simakov (the USSR State Planning Committee) noted in his report, toward the end results is making it possible to implement a unified state science and technology policy on the basis of the analysis and the coordinated interaction of the work of all the units of planning and management at all levels in the following directions: product quality, the efficiency of the use of resources, the changeover to the use of generalizing indicators, which characterize the effectiveness of scientific and technical progress, and the orientation of these indicators toward the achievement of the greatest efficiency of social production.

V.L. Makarov (Corresponding Member of the USSR Academy of Sciences) dwelt on the problems of improving the economic mechanism of the intensification of scientific and technical activity. The time has come to speed up the economization of the sphere of science. The drafting and introduction of principles and standards on the formation of science as a sector of the national economy, a precise definition of the range of its products and the structure of its primary units, and a set of planning and reporting indicators will serve as the first step for this. It is necessary to provide the legal and organizational conditions for the establishment and functioning of cooperatives and other creative scientific collectives in the sphere of science for the purpose of the prompt accomplishment of scientific and technical tasks. The changeover of science to full cost accounting, of which the formation of a mechanism of the pricing of scientific and technical products and a system of state orders for the performance of scientific and technical work, the special-purpose financing of promising projects, and the organization of a sales market of scientific and technical products are components, is the economic basis of the economization of science.

The underlying principles of the improvement of the economic mechanism of science were substantiated in the report of S.B. Perminov (the All-Union Scientific Research Institute of Economic Problems of the Development of Science and Technology of the State Committee for Science and Technology), who noted that the creation of a market of scientific and technical innovations is a necessary condition of its restructuring. The products of scientific and technical progress are becoming a most productive resource, therefore, their exclusion from the sphere of socialist commodity-money relations is adversely affecting the entire present economic mechanism and is hindering the introduction of full cost accounting. It is necessary to create stimuli, which influence the interests of the developers, producers, and users of new equipment by means of long-term standards, the establishment of markups and discounts on the prices of equipment, a flexible credit and financial policy, and so on. It is expedient to monitor strictly the financing of research and development on a nonreturnable basis, inasmuch as this does not guarantee an interest in reducing the expenditures on science. In turn the standards of the distribution of the profit and the system of contracts should become an automatic regulator of the development of the scientific and technical potential. Owing to the diversity of technical innovations and the peculiarities of the various forms and stages of their development a wide range of organizational forms of the "science—technology—production" cycle, which ensure technological leadership and the quick introduction of scientific and technical achievements, should exist.

The revolutionary restructuring of the mechanism of the management of scientific and technical activity presumes as an addition to the change of the economic management mechanism in the sphere of science the reform of the organizational structure of its management. The fundamental principles of the restructuring of the economic organizational methods of the management of the development of science under the conditions of the intensification of the economy were examined in the report of N.N. Obraztsov (the USSR State Committee for Science and Technology). The efficient use of the scientific and technical potential is governed by the state of affairs in the basic economic unit of the sector "science and scientific service"—scientific research institutes and design bureaus. The process of converting basic ideas into specific forms, which are practicable in the conducting of development, takes place precisely at them. State checks of the results of the scientific and technical activity of scientific research institutes and design bureaus over the past 3 years showed that the activity of many scientific organizations does not satisfy the present requirements. Thus, with respect to Moscow alone of the 13 scientific research institutes, which were checked by the State Committee for Science and Technology in 1986, it was proposed to eliminated 5 because of the lack of conformity of the research and development being conducted to the basic directions of their activity, the focus on petty topics and duplication, the low scientific and technical level of developments, the absence of introduction in production, and so on. It was shown that ministries and departments are devoting inadequate attention to restructuring in the sphere of science. The determination of the main directions of scientific and technical activity, the attachment to scientific and technical organizations of the development of specific types of products, and the concentration of the scientific and technical potential on the accomplishment of the most important tasks of the retooling of the sector (subsector) should become the goal of such restructuring. The formation of a network of scientific and technical

organizations, which ensures the optimum use of the accumulated scientific and technical potential, should be the result of such restructuring.

The improvement of not only the economic organizational mechanism of scientific and technical activity, but also the economic organizational methods of the introduction of scientific and technical achievements in production practice, as B.Ye. Kurakin (the State Committee for Inventions and Discoveries) noted, is an important condition of the acceleration of scientific and technical progress. The point is that the share of research and development, which are based on inventions, as before is low. About half of all the applications received for an invention yield an economic impact of less than 5,000 rubles and only approximately 0.1 percent yield an impact of more than 1 million rubles. There are many reasons for this. Among the basic ones one should single out the inadequate economic interest in the development of highly efficient intersectorial scientific and technical achievements, the weak legal basis of invention, the lack of an introducing unit in the economic complex, and so on. The urgent need for a law on invention as a mandatory component of the economic activity of the state enterprise (association) has arisen.

The report of Ye.I. Tyurin (the Central Council of the All-Union Society of Inventors and Efficiency Experts) was devoted to the problems of developing inventing work at academic scientific institutions. A special Council of the Coordinating Center, which coordinates the efforts of academic science and higher educational institutions on the selection and the promotion of the introduction of inventions, was established for the purpose of speeding up the introduction of major scientific and technical achievements of academic science in production. This council is a component of the Interdepartmental Commission of the USSR State Planning Committee for Questions of the Acceleration of the Introduction in the National Economy of Especially Important Inventions.

A.N. Lyusov (the Academy of the National Economy attached to the USSR Council of Ministers) dwelt on the difficulties of the present stage of the development of sectorial science. The specific nature of sectorial science in contrast to its other forms (sectors) requires the efficient organization of all the units of the "science—technology—production" cycle. However, thus far the improvement of the organization of sectorial science is inadequately linked with the management and structure of the sector. Using the gained practical experience, one should change over in sectorial science to the "client—contractor" system. Here the basic research, which is conducted by sectorial scientific research institutes, should be linked with the corresponding academic institutes. While with respect to other developments ministries and departments should act as the clients. It is necessary to establish councils for the tracking of the research market and the making of an authoritative scientific and technical evaluation, which will make it possible to pursue a policy of the regulation of research work. The work of the sector (subsector) should become a criterion of the evaluation of the activity of the scientific and technical organization. However, sectorial science as before does not bear responsibility for the scientific and technical level of the corresponding works or the specific product.

I.I. Ishchenko (the USSR State Committee for Construction Affairs) examined the set of problems of the development of scientific and planning and design organizations of the construction type under the new conditions of management. The changeover to new forms of economic activity in the construction complex requires the radical restructuring of the activity of scientific and technical organizations. The economic and the scientific and technical indicators of the activity of sectors of the construction complex reflect the low level of development of construction science and its weak influence on the sectors. The reasons here are the following: the weak economic interest of the enterprise in scientific and technical achievements, the imperfection of the economic management mechanism in the sphere of science (the lack of interest of scientific collectives in the results of their labor), the extensive dissemination of the goal program method of the management of scientific and technical progress was confined only to the "research—development—prototype" stages, but did not encompass the entire science-production cycle. The creation of objective conditions for the acceleration of scientific and technical progress in the construction complex presumes both the increase of the economic interest of construction workers in scientific and technical achievements and the improvement of the economic mechanism in science. The introduction of contract prices for construction work and stable list prices for construction products will interest construction organizations in the use of the most economical types of technology and equipment.

At the same time the change of the system of management in science requires the improvement of the planning of research and development on the basic of an objective evaluation of the results of scientific and technical activity, the optimum use of the accumulated scientific and technical potential, and the introduction of a system of supply orders, state orders, and warranty passports for planned research and development. Steps on the restructuring of the network of scientific and technical organizations are also envisaged. Here sectorial interdepartmental scientific technical associations, within which main scientific research institutes and design bureaus, experimental and pilot production units, enterprises, and engineering centers for the introduction of new equipment will be included, will be established. Moreover, the traditional forms of the integration of science and production: scientific production associations and production associations, planning and construction associations, and creative scientific and technical collectives, will undergo further development. Analytical work, which ensures the evaluation of the conformity of the results of activity to the requirements

of consumers, the economic effectiveness of the use of expenditures, and so on, will play a more and more important role in the process of improving the management of the development of construction science.

The report of I.M. Makarov (the USSR Ministry of Higher and Secondary Specialized Education) was devoted to the role of VUZ science in the acceleration of scientific and technical progress. The main attention was devoted to the necessity of the consolidation of the potentials of VUZ science with academic and sectorial science. The strengthening of the contacts between the different sectors of science should be accomplished by the broadening of the participation of scientists of the USSR Academy of Sciences in the training of highly skilled specialists, the implementation of joint programs in the latest directions of scientific and technical progress, the establishment of interdepartmental creative collectives, and the joint use of scarce scientific equipment.

In the opinion of V.F. Leontyev (the CEMA Secretariat), the strengthening of scientific and technical cooperation with the socialist countries within the framework of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, the goal of which consists in the achievement of the highest world level of science and technology in the most important directions of scientific and technical progress, is an important condition of the efficient use of the scientific and technical potential of our country. Here the Comprehensive Program of Scientific and Technical Progress acts as a tool of the increase of the efficiency of the use of the scientific and technical potential, as well as the intensification of the integration of the scientific and technical potentials of different countries when accomplishing specific measures of scientific and technical progress. The conducting of joint scientific and technical development is a qualitatively new stage of cooperation, which requires not only a change of the organizational methods, financial, and economic management principles, but also the formulation of a new mechanism of the development of the scientific and technical potential. The main organization, which is responsible for the pursuit of a unified science and technology policy in different countries when solving a specific scientific and technical problem, is the central unit of this mechanism of the management of scientific and technical cooperation.

V.I. Guryev (the USSR Central Statistical Administration) dwelt on the urgent questions of the statistical study of the scientific and technical potential. The scientific and technical potential as the aggregate of resources of scientific and technical activity and its results determines the conditions for the accomplishment of the tasks of scientific, technical, and socioeconomic development. The statistics of science in our country has reporting data, which ensure the possibility of analyzing quite thoroughly the network of scientific research institutes and design bureaus and the number, composition, and level of skills of the people employed in science. Surveys of sectorial organizations are being conducted statistically for the purpose of analyzing individual results of their activity and evaluating the technical level and economic efficiency of research and development. Comprehensiveness, the economic analysis of the activity of sectorial scientific research institutes and design bureaus, the development of a set of indicators, which characterize the resources of science and its influence on the acceleration of socioeconomic development, the study of the reserves of the improvement of the use of the scientific and technical potential, the monitoring of the results of the activity of new forms of the integration of science and production, and the comparison of the pace of development of the scientific and technical potential with socialist and capitalist countries are the basic direction of the improvement of the reporting on science.

The information support of scientific and technical progress is a component of the scientific and technical potential of the country and a most important means of its realization, O.V. Kedrovskiy (the USSR State Committee for Science and Technology) believes. However, the present possibilities of information systems in the increase of the quality and level of research and development are being used too little, the vast network of scientific and technical information centers and information subdivisions of scientific research institutes, enterprises, and organizations is not meeting the needs of science and production. There are many reasons. First of all the technological, organizational, and economic bases of scientific and technical information require revision. Great reserves of the increase of the efficiency of the information support of scientific and technical progress lie in the activity of our largest information centers: the All-Union Scientific and Technical Information Center (VNTITsentr), the All-Union Institute of Scientific and Technical Information, the Poisk Scientific Production Association, the State Committee for Inventions and Discoveries, and others. The most significant lag behind the present level of information generation is observed precisely here, while the losses of time from the untimely supply of information to consumers come to many months. The all-union and territorial information centers, which are subordinate to different departments, cannot ensure the smooth operation of the prevailing automated systems of the gathering and processing of data. The changeover to the establishment of large information works and their unification in a new information sector require the revision of the methods of organizing all information activity. The worst traits of the economy of past years are characteristic today of information activity. Thus, to this day the gross indicators of the evaluation of information work predominate. At the same time the changeover of sectors of industry to the new conditions of management immediately affected the increase of the need for specific types of scientific and technical information, as well as for its efficiency and reliability. This is creating the objective prerequisites for the economic restructuring of the information

service. The economic experiment at a number of intersectorial territorial centers, which was begun this year, will make it possible in practice to test the principles of the restructuring of information activity. The formation of a new mechanism on the basis of contractual relations with consumers and the increase of the responsibility for the efficiency and quality of information are the goal of the experiment.

At the section meetings a discussion was launched in the following directions, which characterize the different aspects of scientific and technical activity:

—Section 1—Complex Problems of the Economics of Science;

—Section 2—The Problems of the Formation of a Network of Scientific Organizations;

—Section 3—The Theory and Practice of the Comprehensive Analysis and Evaluation of Scientific and Technical Activity;

—Section 4—The Improvement of the Mechanism of Management and Planning in Science;

—Section 5—The Increase of the Efficiency of the Use of the Scientific Personnel and Material and Technical Resources of Scientific Organizations;

—Section 6—The Information Support of the Management of Science;

—Section 7—The Improvement of the Economic Organizational Levers of the Introduction of Scientific and Technical Achievements in Production;

—Section 8—The Economic Problems of the Integration of Science With Production.

During the discussion of the raised questions the scientists and specialists came to the unanimous conclusion that for the purpose of implementing the strategic policy of the party and government of the sharp acceleration of socioeconomic development on the basis of scientific and technical progress it is necessary to implement a set of measures for the increase of the efficiency of the use of the accumulated scientific and technical potential, especially in the sectorial sector of science. The program of the radical restructuring of the economic organizational mechanism of scientific and technical activity should include the concentration of the scientific and technical potential on the accomplishment of the priority directions of scientific and technical progress, the increase of the responsibility of ministries and departments for the activity of their own scientific organizations, and the development in the sphere of science of an economic mechanism, which ensures an economic interest and financial responsibility for the end results.

Special attention was directed to the necessity of the concentration of the forces of scientologists on the development of the theory and methods of the organization and management of the scientific and technical activity of scientific research institutes and design bureaus of the different sectors of science. For this it is necessary to formulate and implement a comprehensive goal program on the management of the development of science. It is advisable to assign the functions on the coordination of this work to the scientific council for this problem, which has been specially established under the State Committee for Science and Technology. The need for the publication of a special scientological journal became urgent long ago.

The conference participants noted that during the period, which had passed since the first conference, many of the adopted decisions had not received practical implementation. Thus, in particular, the mechanism of the planning of scientific and technical activity, which as before is characterized by a lack of coordination with the planning of the introduction of new equipment in production, has not been improved. An economic mechanism of the introduction of scientific and technical achievements in production has also not been developed. Scientific organizations are still far from full cost accounting, which is being introduced more and more extensively in production. The lack of methods of the rate setting of scientific labor and the absence of pricing of scientific and technical products are one of the basic obstacles for this. The problem of improving analytical work in the sphere of science is also among the unsolved ones. It is necessary to pose most earnestly to ministries the question of the establishment of a state system of analytical work at scientific organizations, which would ensure the monitoring of *the reserves of the saving of resources,* which are being channeled into science. The methods of the organization and supervision of scientific and technical activity on the part of superior ministries and departments are evoking more and more serious criticism. The statistical and information support of the management of science is being improved slowly.

In short, real restructuring in the sphere of science will be ensured not by the implementation of partial measures, but by the development of a effective legal, organizational, economic management, and social mechanism of the management of scientific and technical activity, which will make it possible to put to use the entire set of factors of the intensification of the use of the accumulated scientific and technical potential of the country.

7807

International "Znaniye" Society at Exhibition

18140239a Moscow NTR: PROBLEMY I RESHENIYA in Russian No 6 22 Mar-4 Apr 88 pp 1-2

[Article by O. Lebedeva: "Tekhnologiya-88"]

[Text] **The Moscow Exhibition Complex at Krasnaya Presna. 21-26 March. The builders—the West German firm Glocke Internationale, with assistance by the V/O [All-Union Association] Ekspotsentr, USSR Chamber of Commerce and Industry.**

G. Stolyarova, senior consultant to Inovystavka [Foreign Exhibitions], V/O Ekspotsentr, explains the exhibition Tekhnologiya-88.

This year 145 firms, organizations and enterprises from 17 countries and West Berlin will participate in the exhibit of progressive technology in machine building, metalworking, environmental protection, mining and other sectors. The exhibiters include well known coroporations such as Berstoff and Gertner from the FRG, Sandvik and Atlas-Kopko from Sweden, Comef and Cultronics from France, Mikroelektronics from Hungary, Comau from Italy and other firms.

I think that the Tekhnologiya-88 Exposition will include all modern directions in technological development. There will be machine tools with numerical control, industrial robots, various types of computers and peripherals, automatic lines for construction and transportation and control-measurement instruments. There will also be facilities for recycling materials.

There will be lectures and symposia at the exhibition. Specialists will learn about the demands made upon "designers of the future" at the Consulting Department of the firm Glocke Internationale, about the latest achievements in the continuous casting of steel at the Austrian firm Fest-Alpine and the multimodal transport systems of the Finnish firm Rautarukki.

Our country will present three exhibits at Tekhnologiya-88. These include the V/O Litsenzintorg and the NPO [Scientific Production Association] Biofarmavtomatika from Gorky. At the exhibit the NPO will present its work to foreign participants and firms accredited in Moscow. It is only at first glance that the third Soviet exhibitor—the All-Union Society "Znaniye"—seems unusual for a technology exhibition. But, it possesses the technology for spreading knowledge. The specific features of this work have become pivotal to exhibitions and society. Interestingly, the exhibit not only presents the experience of Znaniye, but also the tasks which it must solve literally by tomorrow.

Up until now the society has been spreading knowledge in the form of printed matter, lectures, interviews, excursions and museum exhibits—in short, by traditional methods. Now the arsenal of methods is being expanded in the most unusual manner. Under the society's aegis, work has begun on setting up Interznaniye, an international association with no equivalent anyplace in the world. This organization, to operate on cost accounting and self-financing principles, should: support business cooperation between scientists and specialists from different countries to create an international market in knowledge, create comfortable creative conditions for the producers of new knowledge and, most importantly, assist in humanizing all types of human activities.

The essence of the Znaniye exhibit, is in the slogan "A Glance into the Future." It presents our suggestions to foreign partners concerning the creation of joint international enterprises, draft plans and programs. These include: a draft plan for a "People's Observatory" directed towards giving people a cosmic culture, the creation of a science and technology park and enterprises for the production of "Epcot Center-like" parks. A Center for Cultural Cooperation is also planned for countries to mutually enrich each other with their national experience in music, architecture, painting, the industrial arts, etc. Foreign firms have shown interest in many draft plans. For example, a cinema with a capacity of 300, giving viewers the impression of being in the screen, will have equipment from the Canadian-American firm IMAX.

Within the framework of Interznaniye it has been decided to organize a computer club which will unite enthusiasts in information science. The informal basis of this club will be fertile ground for the creation of new ideas. Also, there will be ideas created by collective intelligence at international conferences, telebridges and interviews with the most famous specialists in a given field and the work of temporary collectives.

The construction of Interznaniye projects in our country is in harmony with the ideology of humanism being propagated by Znaniye. Parcels of "dead" land, worked out quarries not suited for traditional methods of construction or for agriculture and not far from the capital, are being proposed as the sites for the cinema, science and technology park and health center. These are the most suitable testing grounds for new construction technologies. They were also included in exhibits at Tekhnologiya-88. The Znaniye exhibit shows techniques for restoring such technocratic wounds to the earth. They are proposed as sites for social and cultural facilities. Scholars and specialists from various countries, united by their association with Interznaniye, will work and relax there.

11574

Exhibitions Described

18140239b Moscow NTR: PROBLEMY I RESHENIYA in Russian No 6, 22 Mar-4 Apr 88 p 3

[Article: "Exhibitions in April, May and June"]

[Text] **V. Tatarenko, manager of the Press Center V/O "Sovintsentr" USSR Chamber of Commerce and Industry, announced international and foreign exhibitions for the second quarter of 1988.**

Avtotekhnika-88, the first of them, will be held in Moscow from 12 to 21 April. This review is organized by the West German firm Gebruder Helgib Industrimessen GmbH with the assistance of our association. Specialists will be interested in its equipment for shops, measuring equipment and instruments used in the repair and operation of motor vehicles.

Ptitsevodstvo-88 is an international exhibition dedicated to problems of industrial poultry production. It will be located at the VDNKh Uzbek SSR [Exposition of the Achievements of the Uzbek SSR National Economy] in Tashkent and will feature demonstrations of equipment and processes for producing poultry meat and eggs.

The third international exhibition, Stroydormash-88 will be held from 25 May to 3 June at the Krasnaya Presna Exhibition Complex in Moscow. Specialists will be able to see modern construction and road machinery and other equipment for mechanizing construction work.

Later there will be an exhibition in Leningrad. From 27 June to 3 July this city will host the Seventh International Surveyors Conference and the Exhibition of Surveyors' Instruments and Equipment. Specialists will be able to get a complete view of instruments for geodesic and geophysical survey work, for mine survey and research on problems of mining geomechanics.

In Moscow two days later, on 29 June the International Review of Specialized Transportation Equipment will open. Practically all sectors of the national economy are interested in such equipment. Spetsavtotransport-88 will continue until 6 July.

The Moscow telephone number for inquiries: 269-20-68.

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Economic, Social Aspects of Scientific, Technical Progress

18140249b Moscow EKONOMICHESKIYE NAUKI in Russian No 1, Jan 88 pp 51-61

[Article by Candidate of Economic Sciences Docent K. Kanyuk, editor of a department of the editorial board of the journal EKONOMICHESKIYE NAUKI, under the rubric "The Exchange of Opinions": "Collective Efforts on the Elaboration of the Problems of the Acceleration of Scientific and Technical Progress (A Survey of the Materials of Discussions in Donetsk, Irkutsk, Omsk, Tomsk, and Tula)"; first two paragraphs are EKONOMICHESKIYE NAUKI introduction; passages in italics are as published]

[Text] Within the framework of the discussion, which was begun in No 9 for 1986, meetings "At the Round Table," which were devoted to economic problems of the acceleration of scientific and technical progress, were held in a number of cities. The editorial board thanks all the participants in these discussions, and first of all their organizers—the social correspondents of journals Doctor of Economic Sciences K. Mogilnitskaya (Tomsk) and Candidates of Economic Sciences Docents P. Yevstratov (Tula), V. Gombalevskiy (Irkutsk), I. Kravchenko (Donetsk), and L. Yelovikov (Omsk). We also express our gratitude to Candidate of Economic Sciences Docent V. Vorobyev (Omsk), who generalized the discussion in this city.

At the same time we have to note that, judging from the materials of the "round-table" discussions, which were sent to the editorial board, not all their participants were imbued with the present tasks of political economic science and the demands on it, not everyone strove to address truly burning and urgent questions for the search for their constructive settlement for the purpose of the better use of the achievements of scientific and technical progress in the name of the interests of developing socialism. In a number of cases the speakers did not go beyond long well-known general, in reality, scholastic arguments, which, moreover, at times also do not have a direct bearing on the essence of the problem. This, of course, narrows the possibilities of the survey offered to the readers, making is incumbent, in particular, not to offer several statements to the attention of the readers.

The Essence of the Scientific and Technical Revolution and Scientific and Technical Progress

I. Vorobyeva (candidate of economic sciences, Tomsk) devoted considerable attention to the history of the elaboration of the question, having noted that the first attempts to describe the peculiarities and directions of development of the present scientific and technical revolution were made back in the late 1950's and early 1960's. Despite the predominance of the descriptive approach, they strove already then to identify the connection of this problem with the need to place the progress of science and technology more effectively at the service of the building of the material and technical base of communism and the improvement of social relations. More in-depth studies of the scientific and technical revolution, the arrangement of which it is possible to depict arbitrarily as follows: the essence—the main directions—the socioeconomic peculiarities (under capitalism and socialism)—the consequences, emerged in the middle and late 1960's. In the 1970's the group of problems, which are liable to political economic study, to a significant extent had already crystallized. The concepts "the scientific and technical revolution," "scientific and technical progress," the "technological," "production," and "industrial" revolutions, and others were specified in a quite well-reasoned manner. Such specification in itself does not yet signify the advance of science in the direction of the needs of practice, but creates the necessary prerequisites for this. As to such an advance, this is still a far from accomplished task, and precisely it is today central from the standpoint of the commenced restructuring of the national economy and the entire socioeconomic life of the country.

The tasks of turning toward practice, which have been posed for economic science, determine the necessity of shifting to a new stage of studies of the scientific and technical revolution and scientific and technical progress.

V. Malykhin (docent, candidate of economic sciences, Omsk) and V. Chukhlomin (candidate of economic sciences, Omsk), while developing the same idea, noted that today there is also no unequivocal convincing political economic answer to what scientific and technical progress is in contrast to technical and technological progress. One of the proofs of such a situation, which is hindering fruitful scientific research, is the list of definitions (moreover, far from a complete list), which was cited by L. Logvinov.[1] V. Malykhin and V. Chukhlomin believe that a common approach to the definition of the basic categories of the theory of scientific and technical progress can be developed on the basis of the concept of the innovation cycle, according to which the economic activity of society is carried out organizationally in the following sequence: science—invention—introduction—production—final consumption. The transformation of the source information about the world surrounding us: the acquisition of knowledge—its adaptation to practical use—the materialization of knowledge, is the result of each stage. The main thing, of course, is the last one.

Obviously, the change of the methods of influencing nature on the basis of the knowledge of its laws is the decisive unit of scientific and technical progress. The integration of the methods of labor, which are characteristic of this period of the development of society, forms the content of macrotechnology, the progressive development of which is a more or less lengthy period of the change of the entire technological paradigm. It is more legitimate to describe the content of this period as *technological progress.* The change of the base technological attribute, which is characteristic of this period of social development, takes place not once, but by means of nonsimultaneous *partial revolutions in sectorial and subsectorial methods of labor.* The improvement of the means of labor within one base technology, which has the nature of evolutionary changes, constitutes the content of *technical progress. Scientific progress* is accomplished through cognitive activity and the adaptation of scientifically established or empirically obtained knowledge for direct use in production. *The integration of scientific progress and technical progress is also scientific and technical progress.* The cyclicity of scientific and technical progress is one of its basic properties. The periodically occurring changes of the technological paradigm are *industrial revolutions,* while in combination with scientific progress they are *scientific and technical revolutions.*

A. Popovich (candidate of economic sciences, Omsk) objected to the unjustifiably broad interpretation of scientific and technical progress, when the latter is interpreted as including nearly any progress: organizational, economic, social. Meanwhile one should, obviously, differentiate these types of progress as the different (technical, organizational, economic, and social) levels of the state of production.

Candidate of Economic Sciences Docent L. Yelovikov (Omsk) did not consider satisfactory any of the definitions of the scientific and technical revolution, which were cited in the article of L. Logvinov. All of them are of not a political economic, but a "technological nature," reflect only the interconnection of science, equipment, and technology, and leave aside the political economic aspect proper of the matter: the status of man in the production process at each new stage of the scientific and technical revolution and the change of the criteria of the evaluation of his capacities for labor. In speaking about the scientific and technical revolution as a radical transformation of productive forces, we incomprehensibly lose sight of the fact that they include not only means of production, but also manpower. Need one be amazed that new equipment and technology are introduced slowly and that conservatives of scientific and technical progress exist, if the technological and organizational relations, which are connected with scientific and technical progress, lose contact with economic relations? For example, the lack of scientific foresight and the forecasting of economic relations in the programs of scientific and technical progress, which are formulated for a 20-year period, is an indicator of such a loss of contact.

The essence of the scientific and technical revolution, L. Yelikov believes, *consists in the radical transformation of both means of production and manpower, in the change of the status of man in the production process, and in a new nature and content of production relations.* The main difference of the scientific and technical revolution from scientific and technical progress lies in the fact that the former finds expression not only in the appearance of more advanced technologies, but also *in the change of economic and social relations in society.* Such an approach to the definition of the scientific and technical revolution reveals the necessity of developing systems of the organization and remuneration of labor, which are characteristic of each of its new stages of the economic mechanism.

V. Ispravnikov (docent, candidate of economic sciences, Omsk) agreed with L. Logvinov that it is necessary to differentiate the concepts "scientific and technical progress" and "the scientific and technical revolution" by linking their content not with the progress of science as such, but with the effective technological use of the products of the latter.[2] At the same time the scientific and technical revolution signifies the use on the basis of scientific data of *new forms of the movement of matter* (biological, chemical), *the substance of a field* (the laser, plasma), and so on. Given such an approach the settlement of the question of what equipment it is possible to consider new from a natural scientific standpoint is facilitated.

N. Mukharovskiy (docent, candidate of economic sciences, Omsk) objected to the position of L. Logvinov on the understanding of the technical revolution as "*the gradual improvement* of the equipment and technologies, which are used in production."[3] The technical revolution signifies a *qualitative* improvement, which includes *fundamental changes* in the elements or system of machines. As to the term "technical revolution," it is merely a scientific abstraction. In actual reality it is integrated in the concept "the scientific and technical revolution," since today the interconnection of science and technology is such that they constitute an integral whole.

The qualitatively new state of scientific and technical progress under present conditions is characterized by the fact that in its cyclical development the periods between the evolutionary and the revolutionary forms are shortened, and the latter form becomes dominant—such is the opinion of Candidate of Economic Sciences Docent S. Sinitskiy (Irkutsk).

A. Sukhov (professor, doctor of economic sciences, Tula). In the political economic sense functioning manpower in its various manifestations (the individual worker, the aggregate worker of the enterprise, the aggregate worker of society), which is identical to the productive consumption of the personal factor of social production, is understood as the human factor. In precisely this capacity the human factor is the vehicle and creator of scientific and technical progress. The restructuring of the economy presumes the restructuring of economic thinking, of which, in particular, the labor activity and the scientific and technical creativity of workers are becoming a manifestation. The broadening of the occupational specialization of the worker, the increase of the level of his skills, and occupational shifts on the basis of the change and combination of occupations and specialties act as new forms of labor activity, which reflect the qualitative changes that are occurring in manpower under the influence of scientific and technical progress.

The Role of the Human Factor in the Acceleration of Scientific and Technical Progress

V. Gombalevskiy (docent, candidate of economic sciences, Irkutsk) notes that the effect of scientific and technical progress on the personal factor of production is twofold: first, new demands are made on the quality of manpower (the technical knowledge, skills of workers); second, its significant freeing from physical production and the increase of mobility occur. Under the conditions of the acceleration of scientific and technical progress the organization of a system of the study and forecasting of employment, the training and advanced training of personnel, and the distribution of manpower resources among enterprises, sectors, and regions is especially necessary. It is still possible to tolerate the lack of such a system, when the freeing of manpower is not of a mass nature and under the conditions of primarily extensive reproduction a stable demand for workers of many occupations is maintained. The mass introduction of new equipment, the implementation of the national economic program on the reduction of manual labor, the changeover of enterprises to self-financing, and the broadening in this connection of their independence in the use of the wage fund are sharply intensifying the process of the freeing of manpower. And if we do not prepare for this now, we will be faced with considerable difficulties of not only an economy, but also a social nature.

The statements of Candidate of Economic Sciences G. Usacheva, Candidates of Economic Sciences Docents G. Golubnicha and V. Gobareva (Donetsk), Candidate of Economic Sciences N. Shimshirt (Tomsk), and L. Lukyanchikova (Irkutsk) were devoted to questions of the effect of scientific and technical progress on the development and improvement of the socialist system of the organization of labor. The social orientation of scientific and technical progress, Candidate of Economic Sciences L. Mordasova (Tula) stressed, finds expression in the fact that the new equipment being developed should not only govern the increase of labor productivity, but also increase its appeal, protect the health of the worker, and develop the capabilities of the individual. The reduction of manual, unskilled, and unappealing types of labor is the first step in this direction. The automation and robotization of production and the use of flexible production processes, while decreasing the number of service personnel, at the same time are conducive to the increase of the role of the human factor of production and to the increase of the demands on the general educational and vocational training of the worker.

P. Yevstratov (docent, candidate of economic sciences, Tula) recalled a provision of the new version of the CPSU Program: "The effectiveness of scientific and technical progress depends not only on the increase of the output of the latest equipment, but also on *the better use of fixed capital* and the increase of the output of products per unit of equipment, per square meter of production space."[4] The urgency of the problem of improving the use of the available production potential is also confirmed by the fact that for about 3 decades now given an enormous scale of capital investments a steady decrease of the output-capital ratio has been noted in the national economy. The settlement of the questions of the rationalization of the structure of productive capital, the necessity of its timely modernization, and the establishment of the optimum amounts of accumulation is directly connected with the efficiency of the use of the available production potential. The methods of the economic evaluation of the level of use of productive and nonproductive capital also require further development.

Candidate of Economic Sciences Docent A. Savenko (Tomsk) defended the importance of the reproduction approach to the study of scientific and technical progress. Such an approach makes it possible to follow the economic mechanism of technical progress and to

establish how comprehensive the technological use of the achievements of science is. The same problem was at the center of attention of Candidate of Technical Sciences V. Prusakov (Tula). In case of the reproduction approach, he said, there arises, in particular, the question: Are technical progress and expanded reproduction possible, if the leading increase of the production of means of production is not ensured? Many economists respond negatively to this question. The speaker is of a different opinion and places the emphasis on the fact that the law of the preferential increase of the production of means of production regulates just one, moreover, the quantitative, aspect of technical progress: it is a question of the increase of the mass of machines in the national economy. The qualitative aspect of equipment and its efficiency, as K. Marx showed,[5] are determined by the development of science and the degree of its application in production. Under the conditions of an industrially developed economy, when the share of the production of means of production is quite high and science achieves new gains, the possibilities of *the qualitative improvement of equipment* and the increase of its efficiency are also created, V. Prusakov believes, in case of converging rates of development of the two subdivisions of social production.

The Economic Impact of Scientific and Technical Progress

V. Dolzhnykh (professor, doctor of economic sciences, Irkutsk) indicated that thus far in implementing scientific and technical measures priority has been given to not the economic, but the technological aspect. As a result the increase of technical equipment often led to not a decrease but, on the contrary, an increase of the product cost (as was the case, for example, in the timber industry and in capital construction of the Angara River Region). Enterprises reported a large conditional annual saving from measures on scientific and technical progress, but this impact was simply not recorded by the most strict type of record keeping—accounting. The conditional calculation of the economic impact with the replacement of the actual results with the theoretical results also hindered the matter. As a result the very idea of scientific and technical progress was discredited: the scientific research institutes and enterprises, which "assimilated" (that is, spent) for these purposes more state assets, were in the front ranks of its champions. The economic impact of scientific and technical progress must be estimated not according to the expenditures on it, but according to the end national economic result.

Candidate of Economic Sciences Docent V. Ispravnikov (Omsk) disagreed with the thesis of the recommendation of the indicator of the decrease of the power-output ratio of the products being produced for the role of a generalizing criterion of the effectiveness of scientific and technical progress.[6] Here the point is first of all that not one, even the "best," basic, generalizing indicator is capable of reflecting all the aspects of the efficiency of new equipment. *A set of mutually complementary indicators* is necessary. It can include such indicators as the technical equipment of labor (in value forms the capital-labor ratio, in physical and material form the power- and electric power-labor ratios); the effectiveness of expenditures of embodied labor (the capacity of machines); the effectiveness of expenditures of living labor (labor productivity proper). It is a question of what the excess of the increase of the productivity of living labor in case of the use of new equipment over the increase of its technical equipment should be (quantitatively). The settlement of this question will make it possible to formulate the basic demands on the capacity of new equipment (of course, with inclusion in the system of the evaluation of social and ecological indicators). But it seems to me, Candidate of Economic Sciences L. Ivanova (Omsk) said, that L. Logvinov advanced a very interesting criterion of the evaluation of the effectiveness of measures on new equipment—the power-output ratio. It is also applicable to man, since manpower expenditures are transformed from physical expenditures (muscular strain) into psychophysiological expenditures (memory, thinking, attention). Therefore, when evaluating a technical innovation indicators, which characterize the approximate "parameters" of man, who will use it, should also be used.

The necessity of the timely change of the prices for means of labor, which are still being produced, but for some time now have been obsolete, was discussed in the statement of Candidate of Economic Sciences Docent G. Bachinskiy (Tula). Taking into account the increase in connection with the acceleration of scientific and technical progress of the role of obsolescence (one of the forms of the manifestation of the law of economy of working time), one should "include" it in the economic mechanism as an anti-expenditure factor.

N. Boyarchenko (docent, candidate of economic sciences, Donetsk) spoke about the "effective quality," by which there is understood the degree of utility of a product, which makes it possible to satisfy as much as a specific need with the minimum expenditures of labor. But close contacts of producers and consumers and the corresponding stimulation are necessary for this. The portion of the profit, which emerges owing to the saving of resources and the increase of product quality, should be left at the disposal of the collectives, of which these achievements are the service.

S. Yasinovskaya (Donetsk) believes that the best version of the solution of one technical and economic problem or another should be taken as the standard base in case of the output of a product, this creates an effective economic stimulus for enterprises.

The Social Impact of Scientific and Technical Progress

This important and relatively poorly studied theme, judging from the materials received by the editorial board, did not attract much attention.

The consideration of just *the economic problems* of the acceleration of scientific and technical progress (see No 9, 1986), in the opinion of Candidate of Economic Sciences L. Ivanova (Omsk), narrows the formulation of the problem. And this is not simply a theoretical statement. In practice basic importance is attached to the technical parameters of new items (the output and capacity of equipment, durability, the reliability of its operation, the permissible conditions of use, and so forth). The impact is determined accordingly. The social aspects either are not taken into account at all or are regarded as supplements to the description of the efficiency of the versions of various technical innovations.[7] At the same time precisely now the social and psychophysiological characteristics should be taken more and more into account when designing new equipment and developing new technological processes. The study of the influence of scientific and technical modernization on the vocational skills structure and working conditions, which was made by us at one of the Omsk enterprises, testifies to the inadequate attention to this aspect of the matter: discontent with the latter on the part of workers was discovered. The speaker regards as a shortcoming the fact that in prevailing procedural developments on the determination of the socioeconomic efficiency of new equipment[8] the social impact is taken into account only in terms of economic indicators (the saving of expenditures from public consumption funds on social insurance or health care, and so forth). A set of physical social and psychophysiological indicators is also needed for the evaluation of one version or another of a technical solution.

The same idea, but with the indication of the necessity of also considering the economic impact was developed by Candidate of Economic Sciences M. Shimshirt (Tomsk). Candidate of Economic Sciences Docent V. Prikolotin (Donetsk) also devoted attention to the ecological aspect of the development and use of new equipment.

The manifestations of the "social functions" of new means of labor are especially important when considering the question of combining the achievements of the scientific and technical revolution with the advantages of socialism, Yu. Slovakov (Omsk) stressed. The specific use value of means of labor under socialism consists, in particular, in their "social impact." It seems that the designing of new equipment should proceed to a greater and greater degree "from man," and not from technology, G. Rakitskaya correctly directs attention to this.[9]

N. Mukharovskiy (Omsk) believes that when developing new generations of equipment it is necessary to carry out its *"social certification,"* and not only economic, but also social criteria of its efficiency are needed for this.

The Contradictions of Scientific and Technical Progress

Candidate of Economic Sciences Docent G. Makarova (Irkutsk), in particular, linked one of the causes of the imperfection of the existing mechanism of the management of scientific and technical progress with the inadequate consideration of these contradictions. First of all there is meant here the contradiction between the need for the acceleration of scientific and technical progress and the primary interest of enterprises in the fulfillment of the current plan assignments. B. Smirnov, for example, correctly indicates the existence of this contradiction.[10] The stable assortment and quality of products, fixed prices, work on customary equipment, and the use of customary raw materials are the traditional conditions of the accomplishment of such assignments. Scientific and technical progress inevitably upsets such stability and, hence, reduces the possibilities of fulfilling the current plans without particular trouble. Until the plan assignments are established with the mandatory exceeding of the achieved level, regardless of the possibility of the decrease of production, for example, during the period of modernization and retooling (the completion of which, of course, will make it possible to cover this decrease), enterprises will strive to preserve the existing level of production and will not display an interest in technical progress. In case of planning, G. Marakova also noted, it is necessary to take into account the cyclical nature of scientific and technical progress.

Yu. Nekhoroshev (professor, doctor of economic sciences, Tomsk) said that the conflict of interests of operating production and measures of scientific and technical progress is real and we have to constantly overcome it. The conservatism of an economic manager stems not from his ignorance (although this, unfortunately, also happens), but from the fact that, when fulfilling the plan in rubles, he cannot always agree to the costs which the introduction of innovations requires. Under the conditions, when scientific and technical progress has become an endogenous element of expanded reproduction, the "persistent lack of resolution" of this conflict is an obstacle of social progress. In order to remove this obstacle, *it is necessary to improve, to update not only the superficial forms of the economic mechanism of scientific and technical progress* (indicators, levers of stimulation), *but also the subsurface formations of this mechanism,* moreover, the latter are especially important. There can be no doubts that the public ownership of the means of production and the systematic organization of labor create the greatest and real advantages in the acceleration of scientific and technical progress. The point is that thus far we have not learned to use them properly. Not an abstract general interest in the acceleration of scientific and technical progress, but the real aspiration for it of specific units of production (and the immediate performers) is needed.

The cyclical nature of scientific and technical progress, which reflects the evolutionary and revolutionary forms of its realization, should, Candidate of Economic Sciences Docent V. Biryukov (Omsk) believes, "be detected" by the economic mechanism, creating the necessity of its improvement and, in specific cases, its radical restructuring. The present elaboration and implementation of a set of organizational and economic steps, which adequate reflect the requirements of scientific and

technical progress, are a necessary condition of the acceleration of economic development and the prevention of phenomena of stagnation.

A. Popovich (Omsk) spoke about the fact that a set of contradictions is inherent in scientific and technical progress.

The Economic Mechanism of Scientific and Technical Progress

Now the main problems of scientific and technical progress, as Yu. Nekhoroshev (Tomsk) attempted to show, are introduction, that is, the shortening of the time of the passage of a technical solution to series production, which ensures the retooling of all the sectors of the national economy. Therefore, the restructuring of the system of economic relations and the economic mechanism should make all the units of production and management sensitive to scientific and technical progress and to the increase of the science-intensiveness of production. It is necessary to strive consistently to see to it that *the quality of a product and its technical and economic level would be the main evaluation indicator of the work of every production unit.* Then the increase of the science-intensiveness of production, that is, the share of the spending on measures on scientific and technical progress in the monetary receipts of the cost accounting unit, will act as an anti-expenditure lever and will lead to the decrease of the labor intensity and the resource-output ratio. Economic science and management practice have to comprehend this process more thoroughly and to develop the indicator of science-intensiveness as a "working," evaluation, fund-forming, and stimulating indicator.

The poor sensitivity of the economic mechanism to scientific and technical progress in many respects is explained by the fact that the "expenditure" principle, which makes it possible to fulfill production plans without the fundamental technical modernization and the decrease of the cost of production, is the basis of this mechanism. In the last 25 years various methods of the management and stimulation of scientific and technical progress have been used. Now it is necessary, having selected the best from the gained experience, to "join" these different forms and methods in *an integral economic mechanism that satisfies the requirements of the acceleration of scientific and technical progress.* And this economic mechanism should be unified, without element-by-element management systems (separate ones for production, science, construction, and so forth). However, a block, which is oriented toward the increase of the end results in the sphere of physical production, should be singled out in it.

The fundamental principle—the exclusive state ownership of inventions and other products of science and technology—cannot be subject to doubt and revision. But the implementation of this principle (especially under the conditions of the self-financing of enterprises) allows the possibility of the temporary property attachment of a portion of the inventions to individual state units (first of all primary production units). A scientific and technical development will have a greater chance for introduction, if it is included in the plan of socioeconomic development. And the higher the level of the plan is, the more complete its resource backing is and the greater the probability of accomplishment is.

It is advisable to divide into two groups all the products of science in conformity with their significance for the national economy. The *first group* includes the achievements of science and technology, which are of strategic national economic or defense significance. There cannot be many such works (just as goal programs). Moreover, the problem of their choice will be most difficult, especially as economic science thus far has not proposed simple, well-defined methods of the reliable comparison of the economic effectiveness of scientific and technical measures. When making a choice preference must be given to new technologies. Moreover, the process of the increase of the cost of fuel and raw materials is now explained most often, in reality, from the standpoint of the so-called law of the diminishing fertility of the soil or the law of the diminishing productivity of natural resources, although in the educational process the antiscientific essence of these "laws" is categorically stressed. In reality *the use of traditional technologies under nontraditional conditions* is the cause of the increase of the cost. During the period of the development of the scientific and technical revolution there cannot be a shortage, for example, of fuel, but there is a shortage of technologies of its recovery and production. Hence, it is necessary *to reject the designing of new equipment for obsolete technologies and to turn resolutely to face new technologies, for which it is also necessary to develop fundamentally new equipment.*

Scientific and technical innovations, which can be of commercial value for the cost accounting unit, belong to the *second group.* It is advisable to introduce these developments in a decentralized manner by means of the internal investment fund of the enterprises that have changed over to self-financing. And here some form of the temporary property attachment of the product of science to organizations, which have assumed the expenses either on initial assimilation or on the compensation of the additional labor that is connected with engineering assimilation, is permissible.

The temporary property attachment of the product of science should be backed by legal responsibility for the time of its introduction and the scale of dissemination. A kind of form of scientific and technical rent for the benefit of the holder of the privilege could become an effective stimulus of the more extensive dissemination of innovations. It would be possible by means of it without detriment to the work on the plan to recover completely all the costs of initial assimilation and to stimulate the

entire labor collective, which should be really interested in the introduction of new equipment and technology and in the modernization of the output being produced.

Individual elements of the domestic license, Yu. Nekhoroshev said further, for a long time now have been making their way in the world by means of the system of pricing of developments and new equipment, by the compensatory transfer of scientific and technical know-how, and by the system of economic contracts between institutions of science and enterprises.

The economic mechanism of the acceleration of scientific and technical progress should be not only anti-expenditure, but also antistagnation, that is, flexible and automatically adjustable to new tasks.

V. Sizov (candidate of economic sciences, Tomsk) showed in detail that economic practice testifies: the hindering of scientific and technical progress occurs at the "production—introduction of new equipment" boundary. Hence the particular urgency of the development of effective forms of the integration of science with production. The analysis of such now accepted forms shows that none of them, for all their merits, completely ensures the implementation of the end result of scientific and technical progress—the introduction of new equipment in production. Why is this happening? The basic reason, it must be assumed, is that whereas the process of the development in production of new equipment occurs, as a rule, within the sector, its introduction is carried out at the intersectorial level and here runs into barriers. They should also be eliminated by means of *the close intersectorial cooperation of scientific research, experimental design, and production subdivisions,* which joins the interests of scientists and production workers—the developers and users of new equipment—into a unified whole. From this standpoint it is impossible not to point out the special role of interbranch scientific technical complexes (MNTK's), which are now being established and the task of which consists in the solution of important scientific and technical problems and the assimilation of fundamentally new equipment and technologies. However, the function of introducing new equipment still goes beyond the framework of interbranch scientific technical complexes, and it is necessary to take this into account when organizing them.

The use of the reserves of the acceleration of scientific and technical progress is associated to a greater and greater extent with regional forms of the integration of science and production, one of which is regional scientific production complexes (RNPK's), which implement the scientific and technical programs of a region. Thus, in the regional scientific production complex, which is being formed in Tomsk Oblast, it is proposed to unite an academic scientific research institute, an engineering and technical center, and an intersectorial enterprise for the industrial development of advanced equipment (technology) and its series production in conformity with orders of interested enterprises of the oblast. What are *the advantages of such a form of the integration of science and production?* First, here all the functional units of scientific and technical progress are combined into a unified whole. Second, the problem of introducing scientific and technical achievements does not arise, since the enterprises, which are the users of the new equipment, form themselves the file of orders for the scientific and technical subdivisions of the complex. Third, the intersectorial enterprise, in developing the industrial technology of the production of new equipment, on the one hand, serves as a testing ground for the scientific research institute and the engineering and technical center and, on the other, is its producer in the amounts that are needed by the client enterprises. The financial resources of the regional scientific production complex will be formed by means of deductions from the profit of interested enterprises of the region and assets of the budget of the oblast soviet executive committee, while it is proposed to ensure its profitable operation by the sale of the scientific and technical product to the client enterprises at contract prices. The economic impact from the introduction of new equipment and technology will be distributed among all the members of the regional scientific production complex.

I. Vorobyeva (Tomsk) showed that there is still no effective system of the stimulation of scientific and technical progress. Often some forms of such stimulation come into conflict with others. For example, the mark-ups on the prices of new equipment often are conducive to the situation, in case of which the price increases more rapidly than the productivity. At the same time the significance of such a form of the stimulation of scientific and technical progress as the remuneration of the labor of the scientist and the engineer has been undeservedly minimized. One should agree with A. Varshavskiy that one must not use only "positive" material stimuli: bonuses, increments, and so forth. It is also necessary to use "negative" stimuli.[11] V. Pokrovskiy is also absolutely correct when he writes that there cannot be a single, unified system of the stimulation of scientific and technical progress.[12] Here it is necessary to take into consideration the specific nature of different enterprises, sectors, and spheres of production.

One of the basic causes of the poor effectiveness of steps on the acceleration of scientific and technical progress, in the opinion of V. Dementyev (Donetsk), is the lack of the corresponding system of control. The need has arisen, he believes, for the establishment of a unified extradepartmental mechanism of the monitoring of the introduction of new equipment and technology in the national economy. The USSR State Committee for Science and Technology should be the basic unit of the organizational structure of such a mechanism. For this its immediate control functions should be broadened and its role in the coordination of the control activity of other state and public organizations should be increased.

On the Role of VUZ Political Economists in the Acceleration of Scientific and Technical Progress

A. Bychkov (professor, doctor of economic sciences, Tomsk) noted that the implementation of the policy of the 26th CPSU Congress of accelerating scientific and technical progress requires the mobilization of the entire scientific potential of the country, including not last of all the scientific potential of the higher school. Its sector of political economy has considerable forces of science teachers and is capable of providing a much greater return than has been the case up to now. What can and should "VUZ political economy" give the acceleration of scientific and technical progress?

In a speech at the All-Union Conference of Heads of Chairs of the Social Sciences (1986) M.S. Gorbachev stressed: "The party is counting on the increasing contribution of economic science to our campaign for the development of productive forces, the use of leading technologies, the qualitative improvement of production relations, and the change of the forms of management and administration."[13] The reality of such a contribution in many respects depends on the "economic store," which future specialists will acquire at the higher educational institutions, inasmuch as they have to join immediately in scientific and technical progress. In this connection it is possible to define the specific task of the study of political economy (first of all of socialism) as the provision of future specialists with knowledge and the ability and willingness to become vehicles of scientific and technical progress, who are capable of providing a political economic substantiation of technical decisions in production and other spheres of the vital activity of man. I completely agree with L. Logvinov that it is necessary not only to devote more attention than before in the educational course to the study of the political economic problems of scientific and technical progress, but also to make this study systematized,[14] especially as the new syllabus of the course affords such an opportunity. The following questions, in my opinion, deserve special attention of the political economics instructor: the combination of the advantages of socialism with the present scientific and technical revolution and scientific and technical progress; the socioeconomic consequences of scientific and technical progress in socialist society; the economic mechanism of the use and acceleration of scientific and technical progress; the management of scientific and technical progress in the national economy; scientific and technical progress and socialist economic integration in the world socialist economy. These questions have not yet received comprehensive theoretical elaboration, while in educational literature their presentation, as a rule, does not go beyond general declarations, unsystematic unproven assumptions, and good wishes. I will note that the course of the present discussion also testifies to the unfavorable state of the political economic elaboration of the indicated problems of scientific and technical progress: none of the political economists has risked to specially examine them in detail, although the editorial board also called for such a discussion.

Further A. Bychkov told about what is being undertaken for the study and solution of the problems of scientific and technical progress at chairs of Tomsk. Such research during the 12th Five-Year Plan is being conducted on the basis of two scientific goal programs of the RSFSR Ministry of Higher and Secondary Specialized Education: "The Socioeconomic Problems of the Acceleration of Scientific and Technical Progress and the Means of Their Solution" (the main higher educational institution is Leningrad University) and "The Social Progress of Siberia" (the main higher educational institution is Tomsk University). This is making it possible to concentrate in one or two directions the efforts of not only individual chairs, but also all the political economists of the city, which promises the speeding up of the elaboration of theoretical problems and the direct connection of research with the needs of the socioeconomic development of the entire country, and the Siberian Region in particular. In accordance with the plan of scientific work of each chair the participants in the developments are receiving specific assignments for all the years of the five-year plan. Generalizing results of the research should be obtained by 1990. The greater orientation of the research of graduate students toward the problems of scientific and technical progress is also necessary. Here one must focus particular attention on the laws of development of scientific and technical progress under present conditions, the contradictions of scientific and technical progress, and the forms of their resolution; on the economic mechanism of the management and stimulation of scientific and technical progress; on the problems of scientific and technical progress in the Siberian Region, and others.

A few words about the financing of studies of the problems of scientific and technical progress. It is well known, A. Bychkov continued, that the chairs of political economy are conducting research first of all of a general theoretical nature, which often does not have a visible bearing on practice. The participation of these chairs in economic contractual work is very limited. Such a situation is not conducive to the drawing of political economists closer to practice and accordingly narrows the possibilities of the financing of the scientific research of chairs of political economy. The solution, in our opinion, is, *first,* to broaden the participation of chairs of political economy in important economic contractual operations, even if they are being performed in the field of the natural and technical sciences (experience shows that the absence in such operations of a thorough political economic substantiation often depreciates them); *second,* to expand the state budget financing of basic research in the field of political economy and to establish temporary scientific collectives, as well as problem scientific laboratories at higher educational institutions. As directly concerns our city, we have already raised repeatedly the issue that the need arose long ago for the organization of a scientific research institute of socioeconomic research on the basis of the scientific research institute of Tomsk University, which already exists as a voluntary service.

The study in the course of political economy of the problems of the present scientific and technical revolution and the fundamental acceleration of scientific and technical progress is inseparable from the task of forming in students a clear class position with respect to the interpretations of these problems by bourgeois economists, Doctor of Economic Sciences Professor M. Yevseyev (Tomsk) noted. The latter on the basis of assertions about "the cyclical fluctuations of production in the USSR under the conditions of the scientific and technical revolution," "the identity of the forms of use of the achievements of scientific and technical progress under socialism and capitalism," and "the conflict of the scientific and technical revolution and the interests of the workers" draw the conclusions of "the inability of a centralized planned system to ensure the rapid assimilation of the achievements of scientific and technical progress," "the incompatibility of the scientific and technical revolution and socialism," "the unattainability of the national economic optimum under the conditions of the scientific and technical revolution," "the deepening of the scientific and technical gap between the USSR and developed capitalist countries," and others. Instructors should be ready to show in a well-reasoned manner the untenability of these "theories," by the positive presentation from a Marxist standpoint of the scientific conception of scientific and technical progress to convince students of the advantages of socialism in this area as well, and if necessary to use these advantages in every possible way. When revealing the contradictions, which are characteristic of scientific and technical progress under socialism, and identifying our reserves, we must also not limit ourselves just to this. It is necessary to show the real possibilities and means of resolving the contradictions and to cultivate in future specialists the willingness not only in words, but also in deed to defend and realize the advantages of socialism.

V. Malykhin and V. Chukhlomin (Omsk) believe that it would be advisable to publish in the journal special articles, in which the questions of scientific and technical progress, which have been included in the syllabus of the VUZ course of political economy, would be presented in a systematized manner.

Footnotes

1. See L. Logvinov, "Economic Problems of the Acceleration of Scientific and Technical Progress," EKONOMICHESKIYE NAUKI, No 9, 1986, p 18.

2. See EKONOMICHESKIYE NAUKI, No 9, 1986, p 18.

3. Ibid., p 20.

4. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza" [Materials of the 27th Congress of the Communist Party of the Soviet Union], Moscow, 1986, p 143.

5. See K. Marx and F. Engels, "Soch." [Works], 2d edition, Vol 46, Part II, p 215.

6. See EKONOMICHESKIYE NAUKI, No 9, 1986, p 19.

7. It seems that in the discussion such an approach is especially conspicuous in the article of M. Vilenskiy, "Fundamentally New Equipment Is the Basis of Scientific and Technical Progress," who incorporated in the basis of the classification of new equipment exclusively technical and technological attributes (see EKONOMICHESKIYE NAUKI, No 3, 1987).

8. See "Osnovnyye metodicheskiye polozheniya opredeleniya sotsialno-ekonomicheskoy effektivnosti novoy tekhniki" [The Basic Procedural Principles of the Determination of the Socioeconomic Efficiency of New Equipment], Moscow, 1980.

9. See G. Rakitskaya, "The Socioeconomic Nature of Scientific and Technical Progress," EKONOMICHESKIYE NAUKI, No 12, 1986, p 45.

10. See B. Smirnov, "The Contradictions of the Increase of Production Efficiency on the Basis of Scientific and Technical Progress," EKONOMICHESKIYE NAUKI, No 2, 1987.

11. See A. Varshavskiy, "The Progress of Technology: Means of Its Acceleration," EKONOMICHESKIYE NAUKI, No 11, 1986, p 29.

12. See V. Pokrovskiy, "Problems of the Stimulation of Scientific and Technical Progress," EKONOMICHESKIYE NAUKI, No 10, 1986, p 27.

13. "Learn to Think and Act in the New Way. The All-Union Conference of Heads of Chairs of the Social Sciences. Speech of General Secretary of the CPSU Central Committee M.S. Gorbachev," KOMMUNIST, No 15, 1986, p 4.

14. See EKONOMICHESKIYE NAUKI, No 9, 1986, p 17.

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All-Union Congress of Scientific, Technical Societies

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[Article: "By the Course of Acceleration. The 7th All-Union Congress of Scientific and Technical Societies"]

[Text] Today the 24 all-union scientific and technical societies of the country unite nearly 30 million scientists, engineers, technicians, economists, and leading workers and kolkhoz farmers.

The problems of the maximum use of the powerful potential of these creative societies and their active participation in the processes of the restructuring of the economic and social life of the country are at the center of attention of the 7th All-Union Congress of Scientific and Technical Societies, which opened on 2 February in Moscow, in the Great Kremlin Palace.

Comrades L.N. Zaykov, N.N. Slyunkov, V.I. Dolgikh, and G.P. Razumovskiy are on the presidium. First Deputy Chairman of the USSR Council of Ministers V.S. Murakhovskiy, Deputy Chairman of the USSR Council of Ministers I.S. Silayev, Chairman of the All-Union Central Council of Trade Unions S.A. Shalayev, responsible officials of the CPSU Central Committee, executives of ministries and departments, scientists, and leaders of production are here. Guests from the fraternal socialist countries and representatives of international scientific and technical organizations are attending the congress.

Academician A.Yu. Ishlinskiy, chairman of the All-Union Council of Scientific and Technical Societies of the country, delivered the accountability report.

The 7th All-Union Congress of Scientific and Technical Societies, the speaker noted, has been convened at a critical stage of the development of Soviet society. The ideas of the April (1985) CPSU Central Committee Plenum and the 27th CPSU Congress, which marked a new historical boundary in the development of Lenin's concept of socialism, are penetrating social consciousness more and more deeply, are taking hold of people, and are becoming a material force. The scientific and technical intelligentsia and all production innovators have actively joined in the process of restructuring.

"Restructuring and the development of democracy make it possible to switch on at full power the energy, possibilities, and rights...of public organizations," M.S. Gorbachev said in his speech at the festive meeting which was devoted to the 70th anniversary of Great October. These words, comrades, have a direct bearing on us. The 27th CPSU Congress proclaimed the acceleration of scientific and technical progress and the reequipment and modernization of production as the basis of restructuring, the basis of the increase of the pace and efficiency of the development of the economy.

This is imposing particular responsibility on our congress. The members of scientific and technical societies expect from it a fundamental analysis of the state of affairs and bold decisions. The congress should provide an answer to the main question: How at the present stage of restructuring is one to turn the enormous possibilities of scientific and technical societies into a real factor of acceleration, to determine the prospect of further development, and, of course, to outline a program of actions? What do the societies have, what are their real possibilities? Our main wealth is, of course, people, who are creatively enthused by their work, are not indifferent, and devote themselves entirely to the service of science and technology. This is actually the cream of the intellectual and innovative potential of the country in the area of science and technology, which has its own active civic position.

The societies also have considerable resources for successful activity. Today the 24 all-union scientific and technical societies at associations and enterprises, scientific research institutes and design bureaus, mines and fields, kolkhozes and sovkhozes, higher educational institutions and technical schools have more than 140,000 primary organizations. At the 66 large industrial centers of the country our houses of technology are performing much useful work on the promotion of the achievements of science and technology and are contributing to the increase of the skills and the level of scientific, technical, and economic knowledge of workers.

In conformity with the decisions of the 6th All-Union Congress of Scientific and Technical Societies, the speaker continued, the influence of the societies on the formulation and fulfillment of plans on new equipment and socioeconomic and scientific and technical programs has increased. Questions of the elaboration of comprehensive intersectorial problems held an important place in the activity of the societies. In recent years the All-Union Council of Scientific and Technical Societies has prepared more than 40 large-scale developments in the area of computer technology, machine building, and the intensification of agriculture and in other urgent directions.

However, unfortunately, "fate" is forming favorably for far from all the suggestions of the scientific and technical community. Here is an example. The Committee for Transportation of the All-Union Council of Scientific and Technical Societies developed an integrated technology of the transportation of large heavy equipment, which makes it possible to shorten to one-fourth to one-third the time of the construction of industrial facilities and to reduce by one-fourth the cost of construction and installation work. The national economic impact from introduction to this year has come to more than 500 million rubles. But it could have been much more, since this technology was suggested by the community back in 1975, but so far has been introduced far from completely.

At the last, 6th congress questions of increasing product quality were at the center of our attention. During this time the councils and boards of scientific and technical societies have stepped up the work of quality circles at enterprises and have organized the conducting of public appraisals and the certification of the most important types of products. The initiatives of the scientific and technical community of the paper and wood processing,

petroleum, and gas industries, Moscow, Kiev, and Leningrad Oblast received extensive support. The new forms of work of the organizations of the scientific and technical societies of Armenia, Lithuania, Penza, Tula, Krasnoyarsk, Volgograd, Ulyanovsk, and Poltava are well known.

As a whole the results of the period under review convincingly show what enormous potentials our scientific and technical community has and what a powerful store of initiative and creativity it carries. In essence scientific and technical societies have turned into a creative union of the scientific and technical intelligentsia and production innovators, which encompasses by its influence practically all the units of the national economy and levels of management.

And at the same time it is quite evident, the speaker stressed, that this potential is obviously being used inadequately. The precongress discussion revealed serious problems in the understanding of the primary thing—the role and place, the intention of scientific and technical societies under present conditions, the basic directions of their activity, the goals and tasks. It revealed our shortcomings. The group of problems, on which the societies have set to work, often without determining the specific means of their solution, has expanded rapidly. In many cases scientific and technical societies have lost independence and along with it equality with economic organs in the settlement of key questions of scientific and technical progress. The aspiration of many organizations of scientific and technical societies to bring automatically to their aktiv everything that has been done in labor collectives for the introduction of the achievements of science and technology has come to light. Where is one to get under these conditions an active, vigorous position which is necessary today?

Meanwhile a number of important problems needed defense on the part of the qualified public opinion of enthusiasts. While often knowing these problems well, moreover, frequently being their first elaborators, scientific and technical societies were not able to attract the attention of broad circles of the community to their solution.

Of course, the social status of scientific and technical societies under present conditions obviously does not correspond to the role of science and technology in the occurring revolutionary changes. But this cannot serve to any extent as justification of the fact that the arguments about inadequate rights and about the necessity of giving the societies broad administrative powers were accompanied at a number of organizations by just as timid attempts at gaining prestige by specific deeds.

The indicated shortcomings had the strongest effect of all on the activity of primary organizations and boards, which operate entirely as a voluntary service. Many of them began to lose their aktiv, competence, and, consequently, influence. Here the vital link of the organizations of scientific and technical societies with the specific person—the enthusiast of scientific and technical progress—broke. The causes of disillusionment and skepticism toward the societies, which, alas, one frequently has occasion to encounter, lie precisely in this.

We have many shortcomings. We are speaking about them openly. But this does not give anyone the right to a negative disdainful attitude toward the societies. But such a stand is already being displayed on the part of several executives of ministries and departments, and first of all where they do not want to consider the opinion of the community, where they ignore its solutions and recommendations and attempt to block the participation of scientific and technical societies in the formulation of technical policy.

How is one to see to it that the public opinion of professionals and enthusiasts of their cause would finally become a real factor of the management of scientific and technical progress? In our opinion, this will become possible only when the extremely necessary system of the public management of the development of science and technology has been established in the country. It is a matter precisely of a system, which is called upon to create a spirit of competition and is capable of ensuring the continuous search for the optimum, including alternative, solutions and of organizing and developing the competition of ideas. It should become a reliable, well-organized partner and, if necessary, an objective and competent opponent of economic organs in the area of science and technology, an institution of real democracy, which reacts keenly to everything new.

We see the means of realizing such a system, the speaker noted, in the establishment of an independent public organization—a union of scientific and engineering societies of the USSR. This will make it possible to increase the role and public importance of creative scientific and technical work, to unite the efforts of societies on the principles of self-management and self-support [samookupayemost], to overcome departmental isolation, and to ensure the further consolidation of the forces of representatives of the natural, technical, and social sciences and product specialists. The Politburo of the CPSU Central Committee has supported this proposal. It was deemed expedient to submit the question of establishing a union of scientific and engineering societies of the USSR for consideration by our congress.

Further Academician A.Yu. Ishlinskiy described the most important, priority problems of scientific and technical progress, on which the attention of the scientific and technical societies of the country has to be focused. These are first of all machine building and the automation and mechanization of production processes.

Just as before, the quality of the output being produced is a concentrated indicator of scientific and technical progress. And here a broad field of activity lies before scientific and technical societies. They can also do much to improve significantly the use of the resource potential of the country.

Then the speaker told in detail about the new forms and methods of work of the primary organizations of scientific and technical societies and analyzed the successes and shortcomings in their activity.

Under the conditions of the new economic mechanism, he noted, the diverse consulting activity of scientific and technical societies is acquiring particular importance. The cost accounting temporary creative collectives (VTK's) and centers of scientific and technical services of organizations of scientific and technical societies may become reliable performers of developments for enterprises.

Production, scientific, technical, and economic propaganda was and remains one of the main directions in the work of societies. Scientific and technical societies can make a significant contribution to the establishment of a system of continuous education. In this connection a very promising model is taking shape. The correspondence institute of the improvement of skills attached to the Central Board of the All-Union Council of Scientific and Technical Societies, which operates in a specific sector of the national economy (today there are six such institutes), is the methods and organizational center. People's universities and other public educational institutions, which implement the principle "education according to need," operate locally together with the institutes and under their supervision. In addition to this cost accounting centers of continuous education of scientific and technical societies are being established in cities. The first such center is already operating in Daugavpils. They are being organized in other cities.

The cooperation of scientific and technical societies with foreign public organizations of the scientific and engineering technical intelligentsia has extensive prospects. We have established the strongest relations with scientific and technical societies of the socialist countries. The most urgent problems, which stem from the priority directions of the Comprehensive Program of Scientific and Technical Development of the CEMA Member Countries, are being discussed more and more often at international forums. In this the activity of the federation of scientific and technical societies of the socialist countries is of great importance.

Throughout the world the engineer is the key figure of modern production. He is the middleman between knowledge and creation. The scientific and technical community of the country has repeatedly voiced in the press anxiety about the decline of the prestige of the engineer and the decrease of his real contribution to the solution of the problems of accelerating scientific and technical progress and has addressed specific proposals to central planning and economic organs and to public organizations of the country. Many of these issues have already found resolved in recent documents of the party and government. In our opinion, the implementation of the suggestion on the establishment of a higher scientific and engineering center of the country—an engineering academy of the USSR—may also provide a lot. It should become an interdepartmental brain center, which ensures the development of the strategic elements in the scientific and technical progress of the socialist economy.

Practice testifies, the speaker said further, that wherever party organs see in the organizations of scientific and technical societies real strength and entrust the solution of important problems, the societies have both prestige and influence. Such trust gives inspiration, and the scientific and technical community will be able to response to it in deed. We have always received and are receiving active assistance and support from the All-Union Central Council of Trade Unions and the central committees of trade unions. But, unfortunately, locally the situation very often is completely different.

The basic directions of the development of scientific and technical societies affects in a most serious manner the charter of the scientific and technical societies of the country. A new version of the charter is being submitted for consideration by the congress.

O.I. Chaban, chairman of the central auditing commission, delivered its accountability report.

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Candidates for Georgian State Prizes Announced

18140207 Tbilisi ZARYA VOSTOKA in Russian
3 Jan 88 p 3

[Announcement: "From the Georgian SSR State Committee on Prizes in Science and Technology, Georgian SSR Council of Ministers"]

[Text] **The Georgian SSR State Committee on Prizes in Science and Technology, Georgian SSR Council of Ministers, announces that the following works have been entered into competition for Georgian SSR State Prizes for 1988.**

IN SCIENCE

1. Abashidze, I. V. (leader), Bolkadze, L. A. , Vadachkoriya, Sh. K., Vardosanidze, I. L., Kipiani, I. A., Metreveli, R. V., Tsertsvadze, Ts. A., Chelidze, Z. A.

Gruzinskaya Sovetskaya Entsiklopediya [Georgian Soviet Encyclopedia] in 12 volumes, Tbilisi, 1975-1987.

Presented by GSSR Goskomizdat [State Committee for Publishing Houses, Printing Plants and Book Trade].

2. Andzhaparidze, I. Ye. Talakhadze, G. R. (leaders) Gogoberidze, I. V., Kirvalidze, R. I., Latariya, V. N., Mindeli, K. V., *Atlas pochv Gruzii* [Atlas of Georgian Soils], Izd. "Sabchota Sakartvelo", Tbilisi, 1984; monograph *Pochvy Gruzii* [Soils of Georgia] Izd. Metsinerba", Tbilisi 1983.

Submitted by Georgian Agricultural Institute.

3. Baakashvili, V. S., *Mekhanicheskoye povedeniye materialov pri plasticheskoy deformatsii* [Mechanical working of materials With Plastic Deformation], monograph, Izd. Tbilisi State University, Tbilisi 1986.

Submitted by Georgian Polytechnic Institute imeni V. I. Lenin.

4. Bogomolov, I. S., Miminoshvili, R. S., *Brat, ty bratstvom silen* [Brother You are Strong by Brotherhood], Izd. "Sovetskiy pisatel", Moscow, 1985.

Submitted by Institute for Georgian Literature imeni Sh. Rustaveli, Georgian SSR Academy of Sciences.

5. Dolidze, I. S. (posthumous) *Pamyatniki gruzinskogo prava* [Landmarks of Georgian Law], in 8 volumes, Tbilisi, 1963-1985.

Submitted by Institute for Archeology and Ethnography imeni I. A. Dzhavakhishvili, Georgian SSR Academy of Sciences.

6. Naskidashvili, P. P. (leader), Gorgidze, A. D. (posthumous), Menabde, V. L. (posthumous), Sikharulidze, M. A., Khutsishvili, G. I., Chernysh, Ye. S., Yashagashvili, G. G., *Genetika, selektsiya—semenovodstvo pshenitsy v Gruzin i vnedreniye sotrov v proizvodstvo* [The Genetics, Selection and Seed Growing of Wheat in Georgia and the Production Introduction of Varieties], 1960-1966.

Submitted by Georgian Agricultural Institute USSR Gosagroprom.

7. Svanidze G. G., monograph *Osnovy rascheta regulirovaniya rechnogo stoka metodom Monte-Karlo [Fundamentals of Calculating River Flow, using Monte Carlo Methods], Izd. "Metsniereba", Tbilisi, 1964; Matematicheskoye modelirovaniye gidrologicheskikh ryadov* [Mathematical Modeling of Hydrological Series] Gidrometizdat, Leningrad, 1977.

Submitted by Transcaucasus Regional NII [Scientific Research Institute], USSR State Committee for Hydrometeorology and Environmental Control.

8. Chikovani, M. Ya. (leader), Bardavelidze, D. K., Gogochuri, D. L., Virsaladze, Ye. B., Zandukeli, P. Z., Matsaberidze, V. S., Sikharulidze, K. A., *Gruzinskaya narodnaya poeziya* [Georgian National Poetry], in 12 volumes, Izd. "Metsniyereba", Tbilisi, 1972-1984.

Submitted by Institute for Georgian Literature imeni Rustaveli Georgian SSR Academy of Sciences.

9. Chilaya G. S. (leader), Vinokur, K. D., Dzhaparidze, K. G. Sikharulidze, D. G., Elashvili, Z. M., *Zhidkiye kristally s indutsirovannoy spiralnoy strukturoy dlya sistem otobrazheniya informatsii* [Liquid Crystals with Induced Spiral Structure for Graphics Display Systems], 1975-1985.

Submitted by is Georgian SSR Academy of Sciences.

IN TECHNOLOGY

1. Asatiani, R. A., Dzhimsheleyshvili, G. S., Lomidze, Sh. A., Machavariani, R. N., Tatishvili, T. I., Tsilosani, Z. N. Chikvaidze, T. V., *Sozdaniye i vnedreniye na obyektakh agropromyshlennogo kompleksa Gruzinskoy SSR izdeliy Izd. drevesiny, propitannoy seroy* [The Treatment of Wood items with Sulphur and their Use in Agro-Industrial Complex Facilities in the Georgian SSR], 1978-1987.

Submitted by by Georgian SSR State Committee for Construction and the Institute for Construction Mechanics and Seismic Engineering imeni K. S. Zavriyeva, Georgian SSR Academy of Sciences.

2. Bakuradze, A. I. Gabisiani, A. G, Kashakashvili, G. V., Lanchava, M. D. Mosiashvili, V. V.., Mumladze, M. V., Shatirishvii, T. A., *Sozdaniye i shiokoye promyshlennoye vnedreniye novoy vysikoeffektivnoy tekhnologii*

obrabotki zhidkoy stali inertnymi gazami [The Creation and Extensive Industrial Introduction of a New Highly Effective Technology for Treating Liquid Steel with Inert Gases], 1983-1987.

Submitted by Rustava Metallurgical Plant, USSR Ministry of Ferrous Metallurgy and the Institute for Metallurgy imeni 50 Years of the Georgian SSR Academy of Sciences.

3. Bochorishvili, E. V., Kukuladze, N. D., Kutateladze, S. N., Mikhelson, R. V., Sulamanidze, V. K., Khomeriki, S. K., *Razrabotka i vnedreniye vysokoeffektivnoy tekhnologii vedeniya vskryshnykh rabot vysokimi ustupami na karere Madneulskogo GOK, obespechivayushchey povysheniye tekhniko-ekonomicheskikh pokazateley i urovney bezopasnosti rabot* [Development and Introduction of a Very Efficient High Wall Technique for Overburden Stripping Work at the Madneulskogo GOK [Mining and Enrichment Combine], Improving Techno-Economic Indicators and Safety], 1979-1986.

Submitted by Institute Mining Engineering imeni G. A. Tsulukidze, Georgian SSR Academy of Sciences.

4. Gilgendorf, I. N., *Issledovaniya fiziko-opticheskimi metodami srednevekovoy monumentalnoy zhivopisi Gruzii* [Physical-Optical Research on Georgian Medieval Monumental Inscriptions] 1966-1987.

Submitted by State Museum of Georgian Art, Georgian SSR Ministry of Culture.

5. Grigoliya, N. G., Dzhobava, D. G., Kacheyshvili, N. N., Kiziriya G. V., Mardzhanishvili, M. A., *Razrabotka i vendreniye novykh konstruktsiy sborno-monolitnykh predvaritelno napryazhennykh fundamentov pod ramnnye i ramno-svyazevyye karkaznyye zdaniya i sooruzheniya* [Development and Introduction of New Structural Components for Precast-Monolithic Prestressed Frame and Frame-Linked Shell Type Buildings and Installations] 1980-1987.

Submitted by Georgian SSR Ministry of Construction.

6. Dzhomardzhidze, G. S. (leader), Dvali, V. S., Ivardava, R. A., Kiladze, G. G., Koshut, S. B., Mgaloblishvili, N. I., Kharebava, L. M., *Kompleks Rabot pp modernizatsii chaesushilnykh mashin i vozdukhonagrevatelnykh ustanovok, vnedreniyu novoy skemy teplosnabzheniya chaynykh fabrik i zashchite okruzhayushchey sredy* [Modernization of Tea Drying Machines and Space heaters, Introduction of new Heating Systems at Tea Processing Plants, and Environmental Protection], 1974-1985.

Submitted by Georgian SSR State Agro-Industrial Committee.

7. Kachakhidze, A. V.(leader), Dzhamrulidze Ya. E. (posthumous), Machariani, A. T., Mdivani, M. L., Khorguani, E. G, Chikadze, V. A., Chkoniya, T. T., *Razrabotka i vnedreniye vysokoproizvoditelnogo metoda pylevoy aerozolnoy vaktsinatsii ptits protiv nyu-kaslskoy bolezni raspyleniyem slukhikh virus-vaktsin* [Development and Introduction of a Highly Productive Method for the Aerosol Vaccination of Poultry Against Newcastle Disease by Spraying Dry Virus Vaccine] 1972-1987.

Submitted by Georgian Zootechnical-Veterinary Training Research Institute, USSR Gosagroprom.

8. Shubitidze, M. K. (leader), Dzhaparidze, T. A., Kartvelishvili, G. M., Nazarov, L. G., Rukhadze, Yu. S., *Razrabotka, izgotovleniye i vnedreniye v proizvodstvo kompleksa tekhnicheskikh sredstva dlya prigotovleniya nekotorykh vidov kolbasnykh izdeliy* [Development, Manufacture and Production Introduction of Systems for Preparing Sausage Items] 1980-1987.

Submitted by Georgian SSR State Agro-Industrial Committee.

FOR TEXTS AND EDUCATIONAL AIDS

1. Gvaramiya, G. G. (leader), Varsimashvili, M. I., Margvelashvili, I. I., Naskdashvili, A. S., Tsanava, M. R., Shatirishvili, N. V. Eligulashvili, A. A., *Razrabotka avtomatizirovannykh uchebnykh posobiy po obshcheobrazovatelnym predmetam na baze EVM i ikh vnedreniye v uchebnyy protsess* [Development of Automated Educational Aids for General Educational Subjects, Based on Computers and their Introduction in the Educational Process] 1980-1987.

Submitted by Georgian SSR Ministry of Education.

2. Tevdzadze, N. A., (posthumous) *Inzhenernaya geodeziya* [Engineering Geodesy] in 10 volumes, Izd. "Ganatleba" Tbilisi State University, Tbilisi, 1974-1985.

Submitted by Georgian SSR Ministry of Higher and Secondary Specialized Education.

In publishing this list of works competing for Georgian SSR Prizes in Science and Technoloy for 1988, the committee is asking the public for its opinion both about the content of these works and the authors' collectives submitting them.

The committee asks leaders of scientific and scientific-technical societies, scientific institutions, enterprises and higher educational institutions to organize public discussions of these works and authors' collectives.

Responses and comments and materials for public discussion should be sent to the committee before 1 February 1988. The committee's address is: 380008 Tbilisi, pr.

Rustaveli, 52, Presidium Georgian SSR Academy of Sciences, Committee for Georgian SSR State Prizes, Georgian SSR Council of Ministers, Floor V, room 525; Telephone: 99-93-29, 93-88-72

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Our Laureates: Prizes Named after Outstanding Ukrainian Scientists Awarded

18140045 Kiev VISNYK AKADEMII NAUK UKRAYINSKOYI RSR in Ukrainianin No 7, Jul 87 pp 86-109, 112-113

Yuriy Mikhaylovich Yermolyev, Igor Nikolayevich Molchanov, and Naum Zuselevich Shor

[Article by Academician V.S. Mikhalevich]

[Text] The authors of a series of works "[Rozrobka i teoretychne obgruntuvannya chyslovykh metodiv rozvyazannya zadach velykoyi rozmirnosti" [Development and Scientific Substantiation of Numerical Methods for Solving High-Dimensionality Problems], Scientific Associates at the Cybernetics Institute imeni V.M. Glushkov, AN USSR [Ukrainian SSR Academy of Sciences], Department Heads, Corresponding Member, AN USSR, Yu.M. Yermolyev and Doctor of Physical Mathematical Sciences I.N. Molchanov, and Laboratory Head, Doctor of Physical Mathematical Sciences N.Z. Shor have found new approaches to solving urgent cybernetics problems.

The series develops and implements V.M. Glushkov's ideas on creatingmethods for solving of and providing program and algorithmic support for problems of management, control, optimization, design and data processing.

Each author had found his own aspect in the problem. For instance, Yu.M. Yermolyev developed new stochastic optimization methods that are indispensable in the design and management of warehousing systems operating under the conditions of risk and inaccurate information. The scientist spent a lot of effort in conducting a theoretical analysis of the proposed methods, proving convergence theorems with the probability of corresponding algorithms and studying the asymptotic speed of convergence. These methods are characterized by weak dependence of convergence speed on dimensionality of optimized variable and random parameters, which makes it possible to use these methods in solving problems with tens of thousands of variables.

These methods are widely known both in our country and abroad. They form the basis of application program packages. Works by Yu.M. Yermolyev and his disciples were highly acclaimed by the International Institute of Applied System Analysis (Austria).

Among the main results obtained by I.N. Molchanov is first of all thedevelopment of theoretically substantiated economical numerical methods for solving high-dimensionality problems, and second of all, determining conditions under which a solution of a mathematical problem still has aphysical meaning. I.N. Molchanov's works deal with problems of truthfulness of mathematical models of various classes of application problems and with the development and theoretical substantiation of algorithms for solving high-dimensionality problems in computer mathematics, including problems with parallel organization of computations. The scientist demonstrated the dependence between an error in the solution of a mathematical problem, the operator properties and the error in specifying the initial data. He has theoretically determined ranges wherein a mathematical description of processes that are taking place retains a physical meaning.

I.N. Molchanov developed new algorithms for solving various classes of computer mathematics problemns with thousands of unknowns. These algorithms and programs based thereon are widely used in practice and have formed the algorithmic foundation for packages of application programs, including ARAS (algorithms for solving algebraic systems).

Based on these algorithms, the structure and architecture of a multiprocessor computer complex with a macroconveyor organization of computations were optimized. The algorithms themselves were used for computerized solution of high-dimensionality problems with a multiple command and data stream, wherein the number of unknowns can be as high as several hundred thousands.

N.Z. Shor proposed new methods for linear, nonlinear and Boolean programming for solving high-dimensionality problems. These methods are based on highly efficient algorithms of nondifferentiated optimization, which he had developed and which can be used for solving coordinating problems originated when using decomposition schemes. In recent years, the scientist has found new methods for deriving estimates for important classes of discrete and multiple-extremum problems. His theoretical results have formed the basis for development of software for solving problems of optimal planning and design in several branches of the national economy and in application program packages PLANER, DISPRO etc.

Works by Yu.M. Yermolyev, I.N. Molchanov and N.Z. Shor are based on common methodological grounds been developed by V.M. Glushkov. Their theoretical research, which is very important both theoretically and practically, has been awarded the V.M. Glushkov Prize.

Vladimir Nikolayevich Koshlyakov and Vilgelm Ilyich Fushchich

[Article by Academician Yu.A. Mitropolskiy and Academician, AN USSR, O.S. Parasyuk]

[Text] A mathematical description and investigation of classical and quantum dynamic systems is a fundamental problem of the mathematical physics and theoretical mechanics. As a rule, such dynamic systems are described by nonlinear multidimensional differential and integral-differential equations.

For a series of works "Analitychni metody doslidzhennya dynamichnykh system" [Analytical Methods for Studies of Dynamic Systems], Corresponding Member, AN USSR, Department Head, the Mathematics Institute, AN USSR, V.N. Koshlyakov and Doctor of Physical Mathematical Sciences, Professor, Department Head, the Mathematics Institute, AN USSR, V.I. Fushchich have been awarded the N.N. Krylov Prize.

Scientific works by V.N. Koshlyakov are devoted to the development of methods for studying motion of solid bodies and gyroscopic navigational systems. Based on the theory of unitary and Hermitian matrices and the theory of representations of groups of rotations and Rodrig-Hamilton parameters, he deduced an equation of a heavy body motion around a fixed point, studied the stability of a heavy asymmetrical body rotating around the vertical and examined motion cases corresponding to the Kovalevskaya and Goryachev-Chaplygin cases.

The scientist solved the generalized Magnus problem in the theory of gyroscopic systems, studied in depth dynamic systems that describe functioning of a broad class of correlated air-position indicators and gyrohorizon compasses and drew important practical conclusions regarding the high accuracy and stability of such systems. V.M. Koskhlyakov has implemented all these theoretical studies into the practice of the design and engineering calculations of high-precision navigational equipment. V.I. Fushchich proposed and developed a new costructural method for studying symmetrical properties of partial differential equaitons which made it possible to identify new groups of symmetries in a large number of mathematical physics equations, such as Maxwell's, Dirac's and Lameau's equations. This resulted in discovering previously unknown laws of conservation for electromagnetic and spinor fields. Interestingly enough, it was impossible to reveal these symmetries, using the classical Sophus Lee method.

Based on the theory of noncompact groups, V.I. Fushchich constructed in his works systems of linear and nonlinear equations that are invariant to the Galileo and Poincare group. The theoretical and practical importance of these equations is that they constitute mathematical models of real-life prcesses in the quantum and elementary particle physics.

V.I. Fushchich was the first to construct broad classes of precise solutions of multidimensional nonlinear D'Alambert's, Monge-Ampere's, Hamilton's, Dirac's and Shrodinger's equations.

Scientific achievements of the Laureates have been highly acclaimed by Soviet and foreing specialists.

Vladimir Ilyich Skurikhin, Anatoliy Alekseyevich Morozov and Vsevolod Mikhaylovich Kuntsevich

[Article by Corresponding Member, AN USSR, I.V. Sergiyenko]

[Text] At one time, the creator of the first Soviet computers Academician S.A. Lebedev said that the use of computers would play the decisive role not only in solving scientific and technical problems, but also in managing entire technological complexes.

Nowadays, this forecast of the prominent scientist has been fully proven by the development of science and technology. One cannot imagine modern industry without broad automation of technological processes, neither can one imagine automation without developing control systems based on the use of computers and miscroprocessor technology.

Every year, the most important achievements in the field of computer technology, instrument making and automation and control equipment andsystems are awarded the S.A. Lebedev Prize. This year, the Laureates are the authors of the series "Rozrobka teoretychnykh osnov i stvorennya tsyfrovykh system upravlinnya tekhnologichnymy protsessamy" [Development of Theoretical Fundamentals and Creation of Digital Systems for Control of Technological Processes], Deputy Director, the Cybernetics Institute, AN USSR, Academician, AN USSR, V.I. Skurikhin, Director, a Special Design Bureau of Mathematical Machines and Systems, the Cybernetics Institute, AN USSR, A.A. Morozov and Department Head, the Cybernetics Institute, AN USSR, Doctor of Technical Sciences V.M. Kuntsevich.

The series is a ponderable contribution to solving problems of construction of integrated systems for management of and control at industrial enterprises.

These systems make possible simultaneous integrated control of technological processes and management of the administrative and business activity of enterprises.

In order to create efficient systems of this class, one had to develop algorithms and software, as well as a hardware complex aimed at realization of these algorithms and programs.

V.I. Skurikhin's works deal with the methodology of synthesis, testing and selection of the best control algorithms (the selection must be made at the design stage of

automated systems for the control of technological processes [ASUTP]). The scientist developed methods for simulating a technological control object of continuous production, using a modular mathematical model. This model makes it possible to simulate the object's operation, both in regular and emergency modes. He developed an algorithm for control in cases of deterministic and random disturbances, modules for simulating ASUTP hardware, methods for optimization of design decisions using the simulation model and a methodology for automating the design of system devices. V.I. Skurikhin conducted a comparative analysis of traditional and computer-aided design methods. He proposed formalized selection of automation devices, based on typical modules, and automated computer-aided development of circuit diagrams and text documents.

A.A. Morozov developed principles for construction of integrated schemes for management of industrial enterprises, including their administrative and business activity. He paid main attention to the development, based on the latest achievements in microelectronics and microprocessor technology, of highly-productive hardware complexes for realization of software and algorithmic support of integrated management systems. A.A. Morozov directly participated in the development and implementation of one of the first domestic digital control systems for flexible manufacturing.

V.M. Kuntsevich developed theoretical foundations for construction of a new class of adaptive control systems that use nonstochastic uncertainty models. In order to construct this class of adaptive control systems, he had to develop new algorithms for solving problems of parametric identification that are radically different from traditional algorithms, and to derive his own solutions for problems of control under incertainty conditions. The researcher generalized principal results for the class of multidimensional and nonstationary control objects. The developed algorithms for control and identification constitute the basis for software and algorithms for adaptive control systems based on modern microporcessor technology.

The series of works by V.I. Skurikhin, A.A. Morozov and V.M. Kuntsevich is another step made by our scientists in the development of the cybernetic science.

Aleksandr Yevgenyevich Andreykiv, Dmitriy Vladimirovich Grilitskiy and Grigoriy Semyonovich Kit

[Article by Academician, AN USSR, V.V. Panasyuk]

[Text] A series of works "Zadachi teorii pruzhnosti ta termopruzhnosti dlya til z trishchynamy i vklyuchennyamy" [Problems of Theory of Elasticity and Thermal Elasticity for Bodies With Cracks and Inclusions] has been awarded the A.M. Dynnik Prize. The authors are Head, Department of Structural Strength of Materials in Working Environment, the Physical Mechanical Institute imeni G.V. Karpenko, AN USSR, Doctor of Technical Sciences A.Ye. Andreykiv, Head, Mechanics Department, the Lvov State University imeni I. Franko, Doctor of Technical Sciences D.V. Grilitskiy and Deputy Director, the Applied Problems of Mechanics and Mathematics Institute, AN USSR, Doctor of Physical Mathematical Sciences G.S. Kit.

The series consists of 4 monographs and 11 papers that summarize the results of almost 12 years of the authors' scientific work. It includes fundamental results that have formed the foundation for the new scientific direction, mechanics of deformation and failure of solids with cracks and inclusions in case of complex stressed states caused by static and pulse force factors and by temperature fields of variable geometry. The research is based on design models of elastic equilibrium and local failure of quasibrittle bodies with cracks and inclusions under static and pulse loading, formulated by the authors, and on mathematical methods for practical realization of these models, developed by them.

Using the macrodeformation strength criterion, the researchers were the first to establish criterion equations for deriving basic parameters that affect crack propagation in quasibrittle bodies in cases of complex stressed states caused by force and temperature factors. They developed a generalized approach to determining the stressed-deformed state near the contour of an isolated crack under a complex stressed state.

They further developed an efficient method of two-dimensional singular integral equations for solving a broad class of new three-dimensional problems of determining elastic equilibrium of bodies weakened by a system of flat cracks.

They developed the only so far available method of boundary interpolation for an approximate solution at the engineering level of complex problems of the theory of cracks; these problems are of high practical importance.

They also developed methods for solving two-dimensional problems of heat conduction and thermoelasticity for homogeneous and piece-homogeneous bodies with curvilinear cracks under random force and temperature loads. Using harmonic potentials and analogs thereof, the authors examined boundary problems reduced to singular integral or integral-differential equations, wherein numerical and asymptote methods are used in the general case for solving the equations. They derived a solution for a new class of problems. Based on this solution, they studied interaction of cracks with each other and with body boundaries or material interfaces, and the effect of physical and mechanical properties of a material on strsss intensity in the vicinity of cracks.

They proposed a new approach to determining the stressed state in plates and shells weakened by cracks and thin elastic inclusions. The approach is based on a new design model of an inclusion which made it possible for the first time to construct a solution to problems for the entire feasible spectrum of inclusion rigidity, from absolutely compliant (a crack) to absolutely rigid. This made it possible to reduce the elastic equilibrium problems to systems of singular integral equations and to use efficient methods for solving these problems.

They formulated a new design model for determining the nucleation period of fatigue microcracks in quasibrittle bodies and the period of their subcritical growth under complex stress states. Using design models and mathematical methods, they solved a broad class of practically important problems of strength and failure of solids with cracks and inclusions.

The obtained results form a theoretical foundation for methods for calculating the strength and durability of structural elements. These methods are already being widely implemented into engineering practice, which resulted in considerable savings. Some of the results have been used as the basis for the first Soviet standard on determining characteristics of crack stability of materials.

Vladimir Mefodiyevich Yakovenko, Nikolay Nikolayevich Biletskiy and Svetlana Isaakovna Khankina

[Article by Academician, AN USSR, V.P. Shestopalov]

[Text] Scientists at the Radio Physics and Radio Electronics Institute, AN USSR, Deputy Director, Doctor of Physical Mathematical Sciences V.M. Yakovenko and Senior Scientific Associates, Candidate of Physical Mathematical Sciences N.N. Biletskiy and Doctor of Physical Mathematical Sciences S.I. Khankina have been awarded the K.D. Sinelnikov Prize for a series of works "Poverkhnevi magnitoplazmovi khvyli u napivprovidnykakh" [Surface Magnetoplasma Waves in Semiconductors].

The interest to wave processes in plasma has originated as early as the early 1960's. Studies of these processes made it possible to betterunderstand the nature of the condensed state of aggregation of matter and discover a number of fine effects in the behavior of charge carriers, such as the zone character of the energy spectrum, carrier scattering mechanisms, relation to collective lattice exciters etc.

Studies of plasma effects in semiconductors form a foundation for understanding previously unknown physical principles of generation, propagation, amplification and interaction of electromagnetic oscillations.

Due to application of ultrahigh-frequency semiconductor microelectronic devices in a number of scientific and technical fields (radiolocation, remote control, navigation and communications, computer technology etc.), studies of surface phenomena in solids have recently become especially promising.

In the Prize-awarded series, a new class of electromagnetic field oscillations, slow surface magnetoplasma waves in semiconductors, was theoretically predicted and studied. Special attention was paid to surface helicons, because they exist in a wide frequency range, regardless of the relationships between signal and charge collision frequencies.

Based on a hydrodynamic model, the Laureates studied dispersion, polarization and energy characteristics of surface helicons. They also demonstrated that the waves can exist in a wide class of conducting solid bodies and in classic and quantisizing magnetic fields, and that the waves have relatively low velocities and can be easily controlled with the help of external magnetic fields.

At the ferrite-semiconductor interface, interaction of surface helicons with electronic and nuclear ferrite subsystems was studied. Because helicon magnetic field components are large, compared to electric ones, strongly connected helicon-spin waves that only exist in certain frequency ranges are generated at the interface. This phenomenon can be used for filtering of oscillations. The scientists have demonstrated that filtration of surface helicons also occurs at a periodically uneven surface of semiconductor plasma.

Surface helicon interaction with acoustic oscillations were also studied. Conditions under which a three-dimensional sound wave completely changes to a surface helicon were determined. In this case, the sound wave reflection factor from the interface becomes equal to zero. This interesting phenomenon can be used for experimental identification of surface helicons. Incidentally, they were observed experimentally by scientists at the All-Union Scientific Research Institute of Physical Technical and Radio Engineering Measurements, AN SSSR [USSR Academy of Sciences], and Semiconductor Physics Institute, Academy of Sciences LiSSR, in n-InSb specimens at room temperatures, at frequences of 20-150 MHz and in magnetic fields up to 25 kE.

The works by V.M. Yakovenko, N.N. Biletskiy and S.I. Khankina made a valuable contribution to the development of physics of electromagnetic processes in semiconductors.

Anatoliy Borisovich Sytnikov, Vadim Ivanovich Lyalko and Nikolay Stepanovich Ognyanik

[Article by Academician, AN USSR, A.V. Chekunov]

Reserves of water resources in the Ukrainian SSR are considerably below the country average, whereas techno-

genic loads at the geological environment are several times higher than the All-Union figure. Approximately two-thirds of drink water supplies here are provided by underground water. This is why the problem of rational utilization of underground water is especially important for the Republic.

A series of works by scientists at the Geological Sciences Institute, AN USSR, ""Teplomasoperenos, okhorona ta upravlinnya pidzemnymy vodamy v umovakh tekhnogenezu" [Heat and Mass Transfer, Protection and Control of Underground Water under Technogenesis Conditions], that deal with this extremely urgent scientific and national economic problem, has been awarded the V.I. Verhadskiy Prize. The Laureates are Head, Technogenic Hydrogeology Department, Doctor of Geological Mineralogical Sciences A.B. Sytnikov, Head, Department of Heat and Mass Transfer in Litosphere,Doctor of Geological Mineralogical Sciences V.I. Lyalko and Head, Laboratory of Permanent Models in Hydrogeology, Candidate of Geological Mineralogical Sciences N.S. Ognyanik.

The series consists of four monographs published in recent years: "Dinamika vlagi i soley v pochvogruntakh zony aeratsii" [Dynamics of Moisture and Salts in Zone of Aeration Soils] by A.B. Sytnikov, "Teplomassoperenos v litosfere" [Heat and Mass Transfer in Lithosphere] by V.I. Lyalko, "Postoyanno deystvuyushchiye matematicheskiye modeli gidrogeologicheskikh protsessov" [Permanent Mathematiccal Models of Hydrogeological Processes] by N.S. Ognyanik and "Okhrana podzemnykh vod v usloviyakh tekhnogeneza" [Protection of Underground Water Under Technogenesis Conditions] by N.S. Ognyanik, A.B. Sytnikov and coauthors. These monographs examine solutions of problems of underground water control and protection, using modern methods for mathematical simulation of hydrogeological processes; they also present data on controlling their status, using on-line remote photography in infrared and radio wave bands and experimental studies at field proving grounds. The authors were the first to develop theoretical and methodological foundations and programs for computer calculation of mass and heat transfer in the underground hydrosphere that take into account physical and chemical interactions in the "water-rock" system, using permanent mathematical models of hydrogeological systems.

The monograph by A.B. Sytnikov gives a theoretical description of nonlinear moisture transfer in the zone of aeration soils and methods for experimental testing of new models of this phenomenon, which make it possible to predict with higher certainty changes in hydrogeological condition of ameliorated land.

The book by V.I. Lyalko presents a quantitative characteristic of energy, filtration and hydrochemical processes in Earth bowels. The author touches upon a wide range of problems, from lithosphere evolution and processes of ore formation to controlling the condition of and protecting underground water.

In his work, N.S. Ognyanik proposed a methodology for developing mathematical models of hydrogeological regions in order to control underground water under technogenic influence and described the experience in developing such model, using the steppe Crimea and the near-Donets region as an example.

Based on the theory of underground mass and heat transfer, the collective monograph "Protection of Underground Water Under Technogenesis Conditions" deals with solutions to urgent water supply problems.

All these works have been widely implemented in practictical solutions of important water supply problems in the Republic which resulted in huge savings. They have also played an important role by accelerating the adoption of important State acts aimed at environmental protection in the Siverskiy Donets river basin and in the Crimea.

Works by A.B. Sytnikov, V.I. Lyalko and N.S. Ognyanik are based on using a unified methodological approach. They made a significant contribution to solutions of ecological problems at the current stage. The V.I. Vernadskiy Prize award recognizes the important contribution made by the scientists into the development of these important problems.

Viktor Ivanovich Trefilov, Yuliy Viktorovich Milman and Sergey Alekseyevich Firstov

[Article by Academician B.Ye. Paton]

[Text] It is well known that, as far as a complex of physical and mechanical properties is concerned, refractory metals with volume-centered lattices, such as tungsten, molibdenum and chrome, are the best base for creating high-temperature alloys for a number of new and traditional technical fields. However, broad application of these metals is deterred by their relatively high cold brittleness temperature and low strength (for certain applications).

In their works, Director, the Problems of Material Science Institute, AN USSR, V.I. Trefilov and the Institute Department Heads, Doctors of Physical Mathematical Sciences Yu.V. Milman and S.A. Firstov have developed scientific foundations for control of mechanical properties of refractory metals and refractory metal-based alloys, by creating cell dislocation structures that are optimal for specific deformation conditions, and by optimum alloying.

For the first time in the world practice, they proved, both theoretically and experimentally, that in order to control mechanical properties of refractory metals it is feasible to have a special type of dislocation structures, cell

structures. It was found that under certain conditions of plastic deformation the borders of dislocation cells, approximately 1 micrometer in size, play the role of grain boundaries, so formation of cell dislocation structures is equivalent to creation of ultrafine-grain metal with the grain size of approximately 1 micrometer. The most important factor is that methods developed by the authors for substructural hardening by forming cell dislocation structures are the only possible ones, because they result in the improvement (and not deterioration, as used always to be the case) of low-temeprature ductility and, even more important, in the decrease of metal embrittlement temperature.

In studying conditions of formation of optimum cell dislocation structures, the authors were using the newest experimental methods and the latest achievements in the solid state physics, at the interface of the theory of real crystals, strength physics and material science.

The scientists developed a widely acclaimed dislocation theory of cold brittleness; they also discovered the phenomenon of a radical change inthe deformation hardening mechanism in the case of transition to larger plastic deformations, due to the formation of structure elements that substantially reduce the effective length of the slip area.

They further developed the understanding of the physical nature of anisotropy of mechanical properties, which is especially strongly expressed in deformed metals with the volume-centered lattice. It was demonstrated that the anisotropy of mechanical properties is the result of superposition of the crystallographic and structure texture. They developed the theory of formation of the structure texture of refractory metals. For the first time it was proved that the structure texture forms not only because of a nonequilibrium grain shape, but also because of a nonequilibrium shape of dislocation cells in the grain. In this case, the energy of dislocation subboundaries that has accumulated during deformation strongly affects mechanical properties.

They considerably advanced the theory of refractory metal alloying for creating alloys that are most suitable for substructural hardening by formation of cell dislocation structures.

V.I. Trefilov, Yu.V. Milman and S.A. Firstov solved a number of important practical problems of plastic deformation of refractory metals. Thus, they developed physical theories of formation of the most dangerous defects in refractory sheet metal: delamination and 45-degree-brittleness. On this basis, they determined optimum rolling modes that eliminate these defects.

In cooperation with scientists at the Electric Welding Institute, AN USSR, they further developed physical understanding of the optimum structure and substructure condition of molibden that has to be welded; it was demonstrated for the first time that weld metal inherits the crystallographic structure of the base metal and that the latter, together with the structure texture, determines mechanical properties of a welded joint.

Structural aspects of hot, thermal and cold pressure shaping of metals were further developed, and the boundary of heat and cold plastic deformation of metals was substantiated physically.

Results that have been obtained form the scientific foundation for optimization of metal compositions and technologies for manufacturing semifinished items made of these metals. The improved alloys and technology for treatment thereof have been implemented and generatedconsiderable savings.

A series of works "Zakonomirnosti formuvannya struktury i mekhanichnykh vlastyvostey tugoplavkykh metaliv ta splaviv na yikh osnovi" [Mechanisms of Formation of Structure and Mechanical Properties of Refractory Metals and Alloys Based Thereon] by V.I. Trefilov, Yu.V. Milman and S.A. Firstov has been awarded the Ye.O. Paton Prize.

Oleg Aleksandrovich Kremnyov and Viktor Yakovlevich Zhuravlenko

[Article by Academician, AN USSR, A.N. Shcherban]

[Text] Both in our country and abroad, a large number of underground structuresare built for mining minerals, gas storage, storage of food and industrial products etc. In operating these structures, one must control air temperature and humidity.

Especially unfavorable thermal conditions develop in deep mine workings. Studies demonstrated that when temperature increases above the permissible value, it negatively affects miners' health and results in a sharp decrease in their productivity. This is why designing optimum methods for horizon opening and selecting the most efficient ventilation schemes and systems for control of thermal conditions affect the economic efficiency of exploitation of mine deposits.

A monograph "Teplo-i massoobmen v gornom massive i podzemnykh sooruzheniyakh" [Heat and Mass Transfer in Rock Mass and Underground Structures] deals with this important problem of the national economy. Former Head, Department of Heat and Mass Transfer Processes and Devices, Deputy Director, the Technical Thermal Physics Institute, AN USSR, Academician, AN USSR, O.A. Kremnyov (posthumously) and Department Head, Candidate of Technical Sciences V.Ya. Zhuravlenko have been awarded the G.F. Proskura Prize for the second edition of the monograph.

The monograph presents results of theoretical and experimental works by O.A. Kremnyov on nonstationary heat transfer and by V.Ya. Zhuravlenko on nonstationary heat and mass transfer between a rock mass and a

ventilating stream and on studying heat and mass transfer processes in models of mine air coolers and heat-utilizing air conditioning units.

The authors have demonstrated that complex processes of heat and mass transfer between the rock mass and the ventilation air take place. Rock mass cooling is intensified in the case of simultaneous diffusion of moisture that evaporates from wall surfaces of a working or from the inside of the rock mass. Temperature distribution and change at any given moment in time follow complex laws; in order to determine these laws, one must jointly solve differential equations of heat and mass conduction at certain boundary conditions.

Based on solutions of these problems, accurate and simplified analytical dependences for determining coefficients of nonstationary heat and mass transfer were derived, and nomographs for determining these coefficients were constructed; analytical dependences for determining air parameters in workings when laws of moisture content change along the length of a working are unknown were also derived.

Economico-mathematical studies of air cooling systems for deep mine stopes made it possible to derive design dependences for system optimization. Similarity conditions and simulation of processes of nonstationary heat and mass transfer between a rock mass and ventilation air were analyzed too. This made it possible to develop a methodology for determining temperature and relative humidity, when heat-moisture properties of a rock mass are known, and methods for design calculation of cooling systems for various underground structures, and to design special air cooling and refrigerating equipment.

In cooperation with industry branch institutes, design work was done for several mines on control of temperature conditions, with air coolers with various cold outputs installed in gentle and steep stopes. State testing of the air coolers were conducted by the Mospa Electromechanical Plant. Series production of heading and face air coolers has been mastered.

In accordance with the plan of scientific and technical and socioeconomic work in cooperation with enterprises and organizations of the Donetskaya and Voroshilovgradskaya oblasts (the "Donbass" program), further development of works aimed at wide production implementation of the research results has been scheduled for the 12th Five-Year Plan.

The monograph is an integrated study that closely combines theoretical problems and problems of practical implementation of the proposed methods in the mining industry.

Anatoliy Petrovich Grekov and Yuriy Yuryevich Kercha

[Article by Academician, AN USSR, V.P. Kukhar]

[Text] Polyurethanes constitute an extremely broad and somewhat unique class of high molecular weight compounds; based on these compounds, various valuable polymer materials can be manufactured.

In the last 10 years, studies of modular structure of segmentedpolyurethanes have been especially active. The character and structural features of these polyurethanes give them properties of both elastomers and thermoplastic polymers. This makes it possible to separate them into a new promising group of polymers, thermoplastic elastomers (thermoelastoplastics).

These polyurethanes open up broad opportunities for creation of various elastic polymer materials with desired practical characteristics.

A series of works "Khimiya ta fiziko-khimiya poliuretaniv segmentnoyi budovy" [Chemistry and Physical Chemistry of Segmented Polyurethanes] by Doctors of Chemical Sciences A.P. Grekov and Yu.Yu. Kercha deals with finding principal synthesis mechanisms and the interrelation between the chemical structure and properties of segmented polyurethanes, and withdetermining principal ways for development and modification of properties of polymer materials based on these polyurethanes.

A.P. Grekov studied chemical foundations for creation of segmented polyurethanes based on oligoetherdioles of various chemical nature and with various molecular masses, as well as diisocyanites and extenders of chains with various chemical structure. He paid main attention to practically important hydrazine-containing segmented polyurethanes (polyurethanesemicarbazides), to the development of methods for controlling their structure and to a number of original methods for their synthesis, both in organic solvents and in water media. He proposed methods for synthesis of new polyurethane ionomers that can self-disperse in water to form stable water dispersions. The latter is especially important for environmental protection, because it opens up the possibility of developing practically wasteless technological processes for manufacturing polyurethane materials.

Yu.Yu. Kercha worked on studying the basic laws of interrelation between the chemical structure of segmented polyurethanes of various nature, on the one hand, and their structure and properties, on the other; he also worked on determining specific features of physico-chemical properties and physico-mechanical behavior of polyurethane systems with modifying additives (disperse inorganic fillers, oligomers, polymers, polarized fluids etc.). He demonstrated that the effect of temperature,

mechanical forces and polarized fluids that affect the course of segregation processes in a system is an efficient method for controlling the structure and properties of segmented polyurethanes.

Specific features of structure formation of filled polyurethanes werestudied for the first time. In the process, the effect of indirect amplification of segmented polyurethanes was discovered: a filler furthers the segregation of rigid elements and strengthens rigid domains that play the role of nodes of a physical grid.

Detailed structural studies of polyurethane ionomers that had been synthesized for the first time made it possible (also for the first time) to demonstrate the difference in principle between this type of ionomers and classic hydrocarbon ones. It was found that specific features of polyurethane ionomers are due to competition between various types of intermolecular interactions and that ion-molecular water bonds, which in the case of segmented polyurethanes increase the diffusivity of rigid domains, play an important role in these interactions. An important result of the work is discovering a the correlation between the chemical structure of segmented polyurethanes, reological properties of concentrated solutions thereof and viscoelastic properties of materials based thereon.

The results obtained by the scientists in the field of chemistry and physical chemistry of segmented polyurethanes have formed the foundation for developing new elastic film-forming polymer materials and for compiling scientifically substantiated recommendations for chemical and physical modification of heterogenic polymer materials based on polyurethane thermoplastics.

The award of the L.V. Pisarzhevskiy Prize to A.P. Grekov and Yu.Yu. Kercha is a well-deserved recognition of their contribution to the development of problems of chemistry and physical chemistry of polyurethanes.

Platon Grigoryevich Kostyuk

[Article by Academician, AN USSR, V.I. Skok]

[Text] Recently, calcium has been an object of growing attention of neurophysiologists. It was found that this element participates in practically all main acts of the excitation process in the nervous system, be it excitement generation and transmission via a nerve fiber or transmitter discharge in synaptic joints, or postsynaptic reactions of nerve, mioblast and glandular cells. However, a large number of problems, such as molecular organization of tracts for transmission of calcium ions in cell membranes, the role of calcium ion exchanges in maintaining integral functions of excitable cells, the functional role of calcium channels that differ from each other in the degree of dependence on cyclic nucleotides metabolism and a number of others, remain unsolved. A monograph "Kaltsiy i kletochnaya vozbudimost" [Calcium and Cell Excitability] by Academician P.G. Kostyuk is of interest exactly because of this.

First of all, the author analyzes the effect of calcium on the surface of excitable cells. This phenomenon was studied at the General Physiology Department, the Physiology Institute imeni A.A. Bogomolets, AN USSR (with the participation and under the direction of the book author), using the method of intracell perfusion of isolated cells, developed by the same collective. The results of experimental determination of bonding of calcium ions to the outer surface of a membrane are presented. The determination is based on two different approaches: studying shifts in the volt-ampere characteristic of ion currents and changes in the electroforetic mobility of cells.

The scientist then presents a detailed characteristic of a calcium channel: its ion selectivity, energy profile, activation and inactivation kinetics and return currents in the channel. Special attention is paid to characteristics of calcium channels at the molecular level; for this purpose, the scientist used both the analysis of transmembrane current fluctuations and direct registration of currents in individual calcium channels.

A large section of the monograph deals with one of the most interesting new branches of neurophysiology, the relation between calcium channels and cell metabolism. It describes metabolic modulation of activity of calcium channels of neuron membranes and miocardium cells and presents data on calcium role in cell differentiation. Calcium ions inside a cell play a special role: they control both the ion permeability of a surface membrane and synaptic transmitter discharge processes, the contraction process in mioblast cells and intracell mass transport. All these aspects of calcium participation in cell processes are examined in extremely great detail, and their biochemical fundamentals are determined.

The scientist pays great attetnion to methods for pharmacological control of calcium channel activity and intracell processes wherein calcium takes part. In particular, he analyzes mechanisms of action of verapamile and its derivatives, 1.4-dihydropiridines, benzdiazepines and calmoduline blockers. These results have formed a theoretical foundation for application of the above compounds in physiology and medicine.

The monograph is the first work in the domestic science that summarizes all main data on calcium participation in a live cell activity that have been obtained in studies at the cell and molecular levels. The book will undoubtedly play a prominent role in the development of neurophysiology, and it deserves the high award, the A.A. Bogomolets Prize.

Mikhail Alekseyevich Kozlov, Svetlana Vasilyevna Kononova and Valentina Ignatyevna Tolkanits

[Article by Corresponding Member, AN USSR, V.A. Topachevskiy; underlined passages are rendered in the Latin alphabet in the original]

[Text] Biological methods for pest control are becoming ever more important under current conditions, because pests cause tremendous damage to agriculture and forestry. Because of this, studies of insects that are pest parasites have become very urgent. The award of the D.K. Zabolotnyy Prize to Doctor of Biological Sciences M.A. Kozlov (the Zoology Institute, AN SSSR) and Candidates of Biological Sciences S.V. Kononova and V.I. Tolkanits (the Zoology Institute imeni I.I. Shmalgauzen, AN USSR) is another illustration of the importance of works in this field. The series of works that has been awarded the Prize includes two monographs: "Ichneumonides-Phytodietines" ("Fauna Ukrayiny" [Fauna of Ukraine], Vol 11, "Parazytychni pereponchastokryli" [Parasitic Hymenoptera], No 1) and "Telenominy fayny SSSR" [Telenomines in USSR Fauna], and section "Metopiinae Subfamily in the "Opredelitel nasekomykh yevropeyskoy chasti SSSR" [Determinant of Insects of the European Part of the USSR].

M.A. Kozlov is a prominent Soviet specialist in the field of systematics, evolution and philogeny of a practically important group of hymenoptera, proctocadavre ichneumon flies. S.V. Kononova successfully works on studying a difficult to define but economically important group of parasitic hymnoptera insects, ovieating scelenoids. Monograph "Telenominy fauny SSSR" (Leningrad, 1983) by M.A. Kozlov and S.V. Kononova was the first to systematize data on 185 species of telenomineichneumon flies (prior to it, not more than 20 species had been defined in the country), with 119 of them being new for science. Besides, the monograph described two new genera. It should be noted that prior to the start of the research by the book authors telenomines in the USSR fauna had not been studied sufficiently: data on this group of insects had been extremely obsolete or contradictory.

The monograph was the first to propose and substantiate a new classification of ovieating telenomines and to reclassify certain genera in the subfamily. Comparative morpholgical studies of telenomines, and particularly of the microsculpture of their body integuments, with the help of a "Stereoskan-2" scanning microscope made it possible to determine principal trends in evolution of these insects; this has formed the basis for the proposed subfamily system.

For over 15 years, V.G. Tolkanits has been working on the research of parasitic hymnoptera, ichenumonide-phytodietines and metopiines, which play an important role in controlling pest insects population. The monograph by V.G. Tolkanits, which deals with phytodietine insects in the Ukraine, and determination charts of metopiines of the European part of the USSR are important original studies; they consitute the first experience in 50 years that summarizes data on these ichneumon flies that are widely distributed over Europe. The research, which was based on revision of typical materials (including materials from a large number of foreign museums), is of great scientific interest; it made a substantial contribution to the development of the entomophag insect classification. All in all, over 200 species in 20 genera of ichneumon flies were examined, 25 of them new to the science.

The development of original determination charts on ichenumonide-metopiines and ovieating telenomines facilitates direct practical implementation of the research. These charts have made it possible for agricultural practitioners to identify the above mentioned groups of parasitic hymnoptera in the European fauna. Analysis of trophic connections of ichneumon flies made it possible for the Laureates to assess their importance in the complex of entomophags of the series and their effect on pests that cause great agricultural and forestry losses (lawn butterflies, leaf-eating apple-orchard pests and tortoise bugs). These data have been used in compiling the Recommendations on identification, definition and utilization of entomophag insects of main apple pests in the Ukraine Forest-Steppe ("Naukova dumka", 1986). Thus, the works awarded the D.K. Zabolotnyy Prize are actively "working" for practice.

Stepan Iosifovich Kusen and Rostislav Stefanovich Stoyko

[Article by Academician, AN USSR, V.K. Lishko]

[Text] Investigation of mechanisms that control cell reproduction in humans and animals is one of the most urgent problems in modern biology. Monograph "Molekulyarnyye mekhanismy v deystvii polipeptidnykh faktorov rosta" [Molecular Mechanisms in Action of Polypeptide Growth Factors], for which the authors have been awarded the A.V. Palladin Prize, substantiates the central role of polypeptide growth factors in controlling cell division and differentiation processes. This is the first work that presents in great detail the latest data on exactly how the growth factors function. S.I. Kusen and R.S. Stoyko had conducted an in-depth analysis and summarized data on all biologically active substances that affect the growth of animal cells. This is why their monograph is a valuable methodological help for a broad group of biologists and physicians.

It is to the authors' credit that they substantiated the thesis of the central role of specific receptors of polypeptide growth factors in determining their effect on target cells. Also important is the conclusion on the informational role played by processes that take place after bonding regulatory ligandes with receptors. Among these

processes is internalization and processing of ligand-receptor complexes, with formation of secondary messengers. These and other conclusions by the authors have been proven experimentally in the the most recent studies.

S.I. Kusen's and R.S. Stoyko's are our contry's pioneering works in the area of studying action mechanisms of polypeptide growth factors and hormones at initial stages of the embryonic development of animals. The authors were among the first to prove experimentally the sensitivity of little-differentiated embryonic cells to the above bioregulators. These cells can be supplied with growth stimulators because of their autochrine formation when there are no specialized endocrine glands. Thus, cells of a fetus at the beginning stages in its development have certain features of malignant cells. Based on this similarity, the authors substantiated the feasibility of using embryonic objects as experimental models, when studying certain aspects of control of processes of malignant transformation of cells.

The monograph is a valuable theoretical summary of works conducted at the Cell Differentiation Biochemistry Department, the Lvov Branch, the Biochemistry Institute imeni A.V. Palladin, AN USSR. Due to its original character, the novelty of problems it raises and its theoretical and methodological importance, it makes substantial contribution to modern biology. The A. V. Palladin Prize award proves this.

Igor Nikolayevich Gudkov

[Article by Corresponding Member, AN USSR, V.V. Morgun]

As the nuclear power industry develops and as application of nuclear physics achievements in biology, medicine and agriculture expands, the role of research in the area of studying mechanisms of organism resistance to ionizing radiation increases. This is the main problem inmodern radiobiology.

Radiation resistance of organisms is a manifestation of a general biological phenomenon of resistance to extremum environmental factors. In the process of evolution, special systems in cells, tissues, organs and organisms as a whole have been formed that ensure their stable functioning not only under favorable conditions, but also under conditions different from standard ones. Radiation resistance is undoubtedly the result of action of these mechanisms. Therefore, a broadly understood solution to this problem is to study and use existing adaptations of an organism to unfavorable environmental factors.

The regeneration system is one of the main elements of organism resistance to any injury. As far as regeneration after radiation injuries is concerned, in the 1950's radiobiologists used to believe that aftereffects of radiation injuries did not lend themselves to modification and that postradiation regeneration of cells was impossible. Up until recently, the very possibility of the existence in plants of regeneration mechanisms after radiation injuries. Monograph "Klitynni mekhanismy pislyaradiatsiynogo vidnovlenny roslyn" [Cell Mechanisms of Postradiation Regeneration of Plants] by Department Head, the Plant Physiology Institute, AN USSR, Doctor of Biological Sciences I.N. Gudkov examines these mechanisms. It has been awarded the N.G. Kholodnyy Prize.

Research of many years, conducted by the author at the Biophysics and Radiation Biology Department, and summarization of literature data made it possible to prove the existence of four main trends in postradiation regeneration in higher plants: reparational, repopulational, regenerational and compensatory. The scientist was the first to successfully demonstrate the existence of extraordinary DNA synthesis in irradiated plant cells, which proves the possibility of reparationalregeneration, the existence of which in higher plants had been heretofore denied.

Based on numerous systematic fine and fairly convincing experiments and on results of analysis of literature data, the author justifiably gives preference in general plant regeneration to the repopulation mechanism. There is no doubt that the existence of numerous and various repopulation reserves in meristems (the author calls them critical plant organs) is an important source of organism resistance to unfavorable influences, including radiation.

As a physiologist, the author identifies a type of regeneration which is only specific to plants: regenerational regeneration; in essence, it is a variety of repopulational regeneration, and the only difference is that in this case repopulation reserves are morphologically delimited in tissues and organs that are at rest. Thus, identification of regenerational regeneration as a special type of regeneration is due to specific features of plant anatomy rather than to the regeneration mechanism itself. In higher plants, this type of regeneration plays an extremely important role in each case of an injury that causes the death of apical meristems.

The author examines the compensatory type of regeneration as a way of postradiation regeneration in its own right. In this case, renewal of functions in a radiation-injured plant is achieved either by uninujred cells carrying a higher load and performing functions of the injured ones, or due to dedifferentiation of specialized cells into proliferating elements. Unfortunately, compensatory phenomena in irradiated organisms have not been studied sufficiently, due to difficulties in experimental identification of corresponding structures. However, one can hope that identification of this type of regeneration will draw attention of a large number of researchers and make it possible to further our knowledge in this field.

The book pays great attention to problems of modification of plant radiation resistance and postradiation regeneration. The author examines a multitude of various factors, physical and chemical in nature, which, when acting on irradiated plants, make it possible to significantly reduce injuries to individual cells and to an organism as a whole. Special attention is paid to phytohormones that help to effectively change the measure and pace of postradiation regeneration.

The main thought that runs through the entire monograph is that radiation resistance and postradiation regeneration capability are nonspecific reactions to injuring influences and that they depend on systems whose mission is to resist effects of unfavorable external factors. The book is concluded with a broad and comprehensive analysis, from the standpoint of the theory of reliability of complex systems, of evolutionally formed resistance mechanisms. The author emphasizes that in this aspect the ionizing radiation plays the role of a very convenient tool, an injuring agent, which penetrates, easily and uniformly, all tissues and cells and lends itself to strict metering. It is this radiobiological approach that has made it possible for the scientist to formulate certain general biological mechanisms that ensure plant resistance and adaptive features. In particular, he demonstrated that reparation mechanisms also manifest themselves when plants are injured by high temperatures or alkylying agents, that repopulational regeneration occurs under the influence of a factor that selectively injures cell populations of meristems and regenerational regeneration occurs in the case of any injury that eliminates the apical dominance.

Basic research of radiation effects and means for radiation protection and postradiation regeneration performed by I.N. Gudkov and his colleagues at the Biophysics and RAdiobiology Department has formed a theoretical foundation for thedevelopment of a number of techniques and technologies used in the national economy.

I.N. Gudkov's monograph undoubtedly makes a valuable contribution to the development of urgent problems of modern plant biology, particularly to the research of plant resistance mechanisms and means for regeneration under unfavorable conditions. In essence, it deals with discovering mechanisms of functioning of special cell systems that expand the areal of their existence. The importance of the work exceeds the limits of plant physiology and radiobiology; it is closely interwoven with problems of molecular and cell biology, pathology and genetics.

Musiy Petrovich Tarasenko, Aleksandr Anatolyevich Ilyinskiy and Vladimir Grigoryevich Kuyan

[Article by Corresponding Member, AN USSR, Yu.R. Shelyag-Sosonko]

[Text] Doctors of Agricultural Sciences M.P. Tarasenko (the Ukrainian Scientific Research Institute of Horticulture), A.A. Ilyinskiy (the Kharkpv Agriculture Institute imeni V.V. Dokuchayev) and V.G. Kuyan (the Zhitomir Agriculture Institute) have been awarded the L.P. Simirenko Prize. The Prize recognizes the many years of research by the authors, aimed at the development of highly intensive fruit plantations with a high yield and high economic efficiency in various regions of the Republic.

Studies of inoculation of fruit species and of the effect of planting material on plantation yield have a special place in the creative activity of the Senior Scientific Associate-Consultant, the Ukrainian Scientific Research Institute of Horticulture, M.P. Tarasenko. The studies conducted by him and under his methodological guidance at research horticulture stations have formed the foundation for the current regional division of fruit species inocula in our Republic.

Based on his experiments of many years, the scientist determined that fruit trees of a certain clone of a variety with an established heredity hardly differ from each other, whether they had been grown from buds offruit bearing plants or of young, not yet fruit-bearing plants. Due to this, fruit seed-plots widely use the practice of laying-in inoculation material taken from non-fruit-bearing plants. If certain conditions are met, this makes it possible to accelerate reproduction of valuable but not widely distributed varieties and to reduce the cost of planting material. The demand for land for fruit breeding plots is also considerably reduced.

Frosts cause a lot of damage to horticulture in our Republic. The most valuable varieties of apple, pear and cherry trees are the most damaged ones. In numerous experiments, M.P. Tarasenko demostrated that in norhtern regions of the UkSSR inoculation of these varieties into the crown of frost-resistant ones, which in this case play the skeleton-forming role, is extremely efficient. The scientist pays great attention to problems of agrotechnics of fruit cultures, improving technology for growing high-yielding planting materials and creating intensive fruit plantations.

Head, Department of Agricultural Products Technology and Fruit and Vegetable Growing, the Kharkov Agriculture Insititute, Professor A.A. Ilyinskiy developed a new for the north-east of the UkSSR technology of growing young plants of fruit trees: instead of sowing stratified seeds at a seeding plot, the seeds are directly sown in the inoculant field with an 80 to 90 cm distance between rows in summer and fall, as fruits ripen (alycha, Mahaleb cherry and small-fruit apricot stones are sown with the pulp, whereas seed-type variety seeds are sown after cleaning the pulp). Thus, seeds are naturally stratified in soil, which significantly accelerates their germination. The seeding ground (the so-called "seedling school") with its crop rotation fields and digging out enrgafted seedlings and planting them at the inoculant field becomes unnecessary, which reduces the size of land and labor and monetary expenditures for growing seed inocula. Next year, the seeds rapidly sprout, and fertilizers

and watering facilitate the growth of seedlings. As a rule, inoculation can be done in August of the same year. A new design of an inoculation knife proposed by A.A. Ilyinskiy makes it possible to make this process three times faster. Next spring, inoculants are cut off above the inoculated bud, and the growth of annual plants starts; good care can accelerate the growth. In July, one cuts off the tops, and in crowns of seed and stone varieties sprouts grow by fall, i.e. crown standard annual plants are formed which can be transferred to a garden. Thus, instead of four years from the moment of sowing it takes only two years to grow seedlings, which significantly increases the output of seed plots.

A.A. Ilyinskiy had developed two forms of tree crowns which underwent a large-scale production testing: a blade-type and Kharkov free-growing palmetto, with under 2.5 m height at seed and medium-height clone inocula, which simplifies tree care and fruit harvesting. Blade crowns are formed by thinning thickened crowns of seed and stone varieties. The thinning consists of cutting vertical gaps between the first order main branches along the entire tree height, which divides the crown into sectors (blades). Both crown forms are very well lighted, and all leaves and fruits are completely covered by sprayed-on pesticide and fertilizer solutions.

Implementation of these techniques in the Ukraine, RSFSR and Moldavia has resulted in substantial savings.

Scientific works by Head, Plant-Growing Department, the Zhitomir Agriculture Institute, Professor V.G. Kuyan are devoted to studying the physiology and biochemistry of apple plants in intensive orchards in a comparatively new intensive horticulture region, the UkSSR woodland zone. He studied metabolism of proteins, enzymes and physiologically active substances at various space positions of tree organs and various formations of flat crowns. He also comprehensively studied the physiological role of individual microelements in various organs of young apple trees in intensive orchards, and growth mechanisms of the above-ground portion and root systems of trees.

In studying the movement and location of proteins and microelements in sprouts, he discovered intersting regularities that make it possible to predict formation of fruit buds in certain parts of a crown. Now, it is possible to install them annually and do it more uniformly, and avoid periodic fruition, which is of the utmost importance to intensive fruit-growing.

Fruit orchards installed in accordance with the scientist's recommendations do not have periodic fruition and provide fruit crops of 250 to 700 metric centners per hectare, depending on the fruit variety.

Based on the Laureates' works, recommendations on regional distribution of inocula were developed and published, as well as recommendations on the technology of growing modern fruit plantations, particularly those with vegetative (dwarfish) inocula. Practical implementation of these recommendations brings in significant savings.

The cycle of work that has been awarded the L.P. Simirenko Prize forms the foundation for technologies for growing highly intensive industrial orchards.

Raisa Maksimovna Tyzh

[Article by Academician, AN USSR, A.M. Grodzinskiy]

[Text] Substantial broadening of the assortment and areal of growing fruit crops and improving the yield, caloricity and flavor thereof are important targets of the Food program. One of the ways to meet this target is to introduce southern fruit cultures in the Ukraine and to grow new high-yield varieties and forms.

Head, Laboratory of Nut-Tree Cultures, the Central Republican Botanical Garden, AN USSR, Candidate of Biological Sciences Raisa Maksimovna Tyzh has been awarded the V.Ya. Yuryev Prize for a series of works on the development and implementation of new high-yield varieties and forms of hazelnuts for the national economy.

Since 1960, the researcher has been studying biological features of peach, almond and hazelnut trees introduced from Kirgiz regions. Eventually, she has fully concentrated on introduction and acclimatization of promising forms of hazelnut trees in northern regions of Ukrainian forest-steppe; she also has been collecting a genetic fund that consists of winter-resistant, immune, high-yield early forms found in the Republic, growing new forms and variety candidates and developing technology for reproduction and growing of the culture.

Selection of early high-yield forms and varieties of hazelnut trees is extremely urgent, because hazelnuts constitute a very valuable product for the food industry, medicine etc. Popular demand for these delicious and healthy nuts is ever growing.

Based on rich experimental materials, R.M. Tyzh wrote a monograph "Skoroplidna i zvychayna formy gorikha voloskogo" [Early and Regular Hazelnut Forms], where she formulated priority theoretical ideas and summarized original practical results of research of biological, physiological and biochemical features of various hazelnut forms.

Implementation of early hazelnut forms in agricultural practice is a necessary job. These forms begin bearing fruit when they are two to three years old. As far as their taste and chemical composition are concerned, they are at par with, and in certain characteristics even better

than, regular forms. Due to their dwarfishness, they can be used to increase the density of nut orchards. Such orchards already exist at the "Ukrayina" sovkhoz, the Donetskaya oblast (10 hectares), and at the Belorechensk scientific-production leskhoz, the Krasnodarskiy kray (also 10 hectares).

Industrial nut plantations and increasing density thereof with other varieties of trees will help to improve land utilization and economic efficiency of fruit growing.

In recent years, the TsRBS [Central Republican Botanical Garden], AN USSR, has been playing the leading role in the country in growing and implementing into the national economy high-yield, immune and frost-resistant early forms of hazelnut trees fit for many regions. Raisa Maksimovna Tyzh'z scientific activity facilitates these activities.

Nikolay Dmitriyevich Prokopenko, Aleksandr Ivanovich Amosha and Bentsion Mikhelevich Birenberg

[Article by Academician, AN USSR, N.G. Chumachenko]

[Text] Radical restructuring of management of the national economy at the regional level is an important condition for acceleration of the social and economic development of our country.

Resolutions of the 27th CPSU Congress provide for improving activities of Councils of Ministers of Union and autonomous Republics and executive committees of local Soviets of People's Deputies and for their increased role in integrated development of regional economy, ensuring rational utilization of labor, raw material and fuel and energy resources, production cooperation, environmental protection and improvement of business efficiency. Results of scientific research covered in a series of works "Udoskonalennya upravlinnya ekonomikoyu regionu" [Improving Regional Economy Management] by a group of scientists at the Industrial Economics Institute, AN USSR, Doctors of Economic Sciences N.D. Prokopenko and A.I. Amosha and Candidate of Economic Sciences B.M. Birenberg significantly facilitate the meeting this goal. The scientists have been awarded the A.G. Shlikhter Prize.

For a number of years, problems of utilization of regional reserves for improving production efficiency by better coordinating principles of territorial and national economy branch management have been studied at the Institute.

During the 11th Five-Year Plan, an important research stage that had brought new scientific and applied results came to an end. A series of works that includes six monographs, sections and chapters in other monographs, papers, presentations, methodological recommendations and other scientific and methodological materials was completed.

An integral combination of theoretical, methodological and procedural developments and practical recommendations aimed at improving the management of the social and economic development of a region while taking into consideration current requirements is a characteristic feature of the series.

Monographs "Sovershenstvovaniye upravleniya ekonomikoy regiona" [Improving Management of Regional Economy] and "Regionalnoye upravleniye: opyt i problemy" [Regional Management: Experience, Problems] study the social and economic nature of a region and its place and role in the development of our society. They define and study factors that form a region as an independent social and economic formation; substantiate the urgency of studying regional economy; show the substance of the "regional efficiency" concept; define criteria and indices; and identify ways for improving the efficiency of utilization of regional resources.

They also study and formulate principles of and conditions for rational coordination of territorial and branch principles in management and elaborate on the problem of creating an economic and organzational mechanism for managing the national economy at the oblast level.

The authors substantiated the concept of "regional reserves of improving production efficiency" and developed a classification of regional resources. They also identified industrial and business processes that can be practically managed in accordance with territorial principles.

The theoretical and methodological structure of the territorial management system is based on the results of studies of the organizational and economic business mechanism.

A two-volume monograph "Razvitiye proizvodstvennykh obyedineniy v promyshlennosti" [Development of Production Associations in Industry] studies processes of the formation and development of production associations and identifies and assesses quantitatively the sources of economic efficiency of formation thereof.

Factors that affect operating efficiency of production associations are identified; the need to plan the formation and development of production associations is demonstrated, and requirements to these projects are formulated. Che country and Republican authorities, executive committees of the Donetskaya oblast's and its cities' Soviets of People's Deputies were given recommendations on improving operating efficiency of the associations.

The series of works that have been awarded the Prize for the first time comprehensively studied problems of socialist control. Monograph "Sotsialisticheskiy kontrol: metody i problemy" [Socialist Control: Methods, Problems] studies in great detail and shows ways for improving control organization and methods in the activity of local Soviets of People's Deputies. The monograph pays great attention to problems of non-branch (territorial) control, particularly of improving its goal-orientedness and efficiency and eliminating inspection parallelism and duplication. The authors' recommendations are used by people's control bodies.

The human factor is the most important aspect of radical restructuring of all facets of life of the Soviet society. This brings to the forefront the objective requirement of its activization. Improving labor conditions and labor protection play an important role in solving this problem.

Monographs "Planirovaniye usloviy truda" [Planning Labor Conditions] and "Usloviya truda v regione" [Regional Labor Conditions] deal with these problems. They substantiate the need to efficiently coordinate territorial and branch forms of managing processes of forming labor conditions in a region.

In the monographs, the main goals in this area are identified, and suggestions on developing an integrated territorial system for management of improvement and protection of labor conditions are formulated. The commonality of regional problems of improvement and protection of labor conditions and environmental protection is demonstrated, and recommendations aimed at an integrated regional solution of these problems are substantiated.

Based on the scientific results they had obtained, the scientists prepared a number of methodological materials, scientific presentations and reports. Of these, we shall note "Deyaki napryamy dalshogo vdoskonalennya upravlinnya narodnym gospodarstvom SRSR" [On Directions for Further Improvement in Managing USSR National Economy] (1983), "Problemy poyednannya galuzevogo i terytorialnogo upravlinnya" [Problems of Coordinating Branch and Territorial Management] (1984), "Kompleksne upravlinnya narodnym gospodarstvom oblasti" [Integrated Management of Oblast Economy] (1985), "Metodychni rekomendatsii po planuvannyu polipshennya umov pratsi v misti" [Methodological Recommendations on Improving Labor Conditions in City] (1983) and sections "Polipshennya umov pratsi" [Improving Labor Conditions] and "Okhorona navkolyshnyogo seredovyshcha" [Environmental Protection] in integrated plans for economic and social development of cities of Donetsk, Yevpatoriya, Berdyansk and Zhdanov.

Theoretical and practical results of scientific activities of the scientists who have been awarded this year's A.G. Shlikhter Prize madean important contribution to the economic science. Their results will become an integral part of a new branch of the economic science, regional economy, which is being formed right now and is dictated by the very development of socialist economy.

Academician, AN USSR, L.A. Shubenko-Shubin is 80 Years Old

[Text] On July 25, a well-known scientist in the field of power generation and power steam and gas turbine building, Hero of Socialist Labor, Academician, AN USSR, Leonid Aleksandrovich Shubenko-Shubin will be 80 years old.

L.A. Shubenko-Shubin is a graduate of the Leningrad State University and the All-Union Boiler and Turbine Institute. He began his working life in 1930 at the Leningrad Metal Plant. Then, since 1931 he had been working for over 10 years at the Kirov Plant, where he worked his way up from a Design Engineer to a Design Bureau Deputy Manager.

During the Great Patriotic War, L.A. Shubenko-Shubin worked in Chelyabinsk, where he was managing a special group in a design bureau and later a turbine assembly department at an enterprise. In 1944-1949, he was heading the Central Scinetific Research Boiler and Turbine Institute in Leningrad.

An important period in the scientist's biography is his work as the Chief Designer at the Kharkov Turbine Plant imeni S.M. Kirov. Over there, steam and gas turbines had been developed under his leadership, and with these turbines the Soviet turbine building industry came to the forefront of the world power machine bulding.

Since 1968, L.A. Shubenko-Shubin has been working in the UkSSR Academy of Sciences, heading the Department of Optimization of Turbine Machine Processes and Design and Power Generating Machines Department at the Problems of Machine Building Institute, AN USSR. Since then, his effort has been aimed at radical improvement of the process of designing powerful power generating turbine plants, based on broad implementation of latest achievements in mathematics and computer technology, and at developing computer-aided systems for optimum design of main components of a turbine plant. The collective he heads developed and implemented computer-aided systems for design and improvement of technological schemes of turbine plants, methods for optimization of main parameters and computer-aided design of turbine stages with long propeller blades, a subsystem for solving problems of controlling heat status of turbine plants in the general system of designing thereof etc. Results of these developments and research have been implemented at a large number of enterprises all over the country.

L.A. Shubenko-Shubin is the author of over 270 scientific works that present innovations in power generation and power steam and gas turbine building and actually

delineate prospects for future developments in the field. The scientist has created a scientific direction and the first nation's school on solving problems of optimization of turbine plant processes and design and on computer-aided design thereof. He has raised 32 Candidates and 2 Doctors of Sciences.

L.A. Shubenko-Shubin heads the Scientific Council, AN USSR, on the problem "Power Machine Building", the Ukrainian Branch of the Scientific Council, AN SSSR, on integrated problems of the power generation industry and the Special Council on Defending Doctor and Candidate of Sciences Dissertations at the Problems of Machine Buuilding Industry Institute, AN USSR; he is also a member of the State Prize Committee, USSR Council of Ministers.

Leoinid Aleksandrovich was elected a delegate to the 19th UkrainianCommunist Party Congress and the 27th CPSU Congress; he also was a Deputy of the 6th and 7th USSR Supreme Soviet. L.A. Shubenko-Shubin is a USSR State Prize Laureate and an Honored UkSSR Inventor. He is a bearer of Orders of October Revolution, Labor Red Banner and Badge of Honor and of several medals.

The scientific community is sincerely congratulating Leonid Aleksandrovich on his birthday and wishing him good health and new creative achievements.

Corresponding Member, AN USSR, L.I. Atanachuk is 50 Years Old

[Text] On July 15, a well-known scientist in the field of thermoelectricity, Corresponding Member, AN USSR, Lukyan Ivanovich Atanachuk will be 50 years old.

L.I. Atanachuk was born in the village of Kolinkovka, Chernovetskaya oblast. All his working, scientific and teaching activities have been connected with the Chernovtsy State University where he was a student, a post-graduate student, and then became a Docent and finally a Professor and a Department Head.

His broad scientific interests have determined the versatility of his research activities. Professionals know very well the scientist's works that have facilitated the development of the generalized theory of thermoelectric energy conversion and creation of new directions in thermoelectricity and new types of thermoelements. By developing methods for securing specified characteristics of thermoelectric materials and corresponding industrial technologies, Lukyan Ivanovich made a substantial contribution to solving material science problems of thermoelectricity.

Under his scientific leadership, a number of thermoelectric instruments and devices that are substantially better than the best domestic and foreign analogs have been developed and implemented. In order to realize required parameters, the scientist proposed an information-energy theory of thermoelectric measurement instruments and used optimum control and analog simulation methods.

L.I. Atanachuk is the author of 60 inventions, some of which have been patented abroad. His scientific achievements have been summarized in 200 published works and two monographs. He raised 10 Candidates of Sciences.

L.I. Atanachuk devotes a lot of energy to science organization work. He initiated the creation of Thermoelectricity Chair, Problem Laboratory and design bureau with experimental production facilities at the Chernovtsy State University. On this basis, a scientific educational complex is in operation; as far as results of its scientific and technical developments are concerned, the complex takes a leading place in the country.

At the UkSSR Academy of Sciences, the scientist heads the Thermoelectricity Section of the Scientific Council, AN USSR, on Problems of Solid State Physics, a regional seminar on physics of semiconductors and the Scientific Coordination Council at the Chernovitskaya oblast Ukrainian Communist Party Committee.

L.I. Atanachuk's services are highly appreciated by the Motherland. He has been awarded the October Revolution and Badge of Honor Orders. He is also a USSR Council of Ministers Prize Laureate.

The scientific community is congratulating Lukyan Ivanovich on his birthday and wishing him good health and new achievements.

12770

Nominations for 1988 State Prizes in Science, Technology

18140231 Moscow IZVESTIYA in Russian 29 Mar 88 p 2

[Article: "From the Committee for Lenin and USSR State Prizes in Science and Technology Attached to the USSR Council of Ministers"]

[Text] The Committee for Lenin and USSR State Pizes in Science and Technology attached to the USSR Council of Ministers reports that the following works have been allowed to participate in the competition for the 1988 State Prizes:

1. V.N. Ageyev, E.Ya. Zandberg, N.I. Ionov, M.A. Mittsev, V.I. Paleyev, A.Ya. Tontegode, L.A. Bolshov, V.K. Medvedev, A.G. Naumovets, Yu.G. Ptushinskiy, A.G.

Fedorus, U.Kh. Rasulev. "Surface Ionization and Thermodesorption Studies of Electron, Atomic, and Molecular Processes on the Surface of a Solid and Their Applications." (A series of works.)

Submitted by the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences and the Institute of Physics of the Ukrainian SSR Academy of Sciences.

2. S.A. Azimov, I. Bobodzhanov, N.A. Dobrotin, G.B. Zhdanov, V.M. Maksimenko, S.A. Slavatinskiy, Yu.A. Smorodin, G.T. Zatsepin, I.P. Ivanenko, I.V. Rakobolskaya, N.N. Roynishvili, T.S. Yuldashbayev. "The Development of the Method of a Large X-Ray Emulsion Chamber and Its Application to Studies of Superhigh-Energy Particles in Cosmic Rays." (A series of works.)

Submitted by the Institute of Physics imeni P.N. Lebedev of the USSR Academy of Sciences.

3. P.D. Altukhov, G.Ye. Pikus, A.A. Rogachev, A.S. Kaminskiy, V.A. Karasyuk, Ya.Ye. Pokrovskiy, V.D. Kulakovskiy, V.B. Timofeyev, S.A. Moskalenko. "Multiple-Exciton Complexes in Semiconductors." (A series of works.)

Submitted by the Institute of Radio Engineering and Electronics of the USSR Academy of Sciences.

4. I.A. Akhiyezer, V.G. Baryakhtar, B.A. Ivanov, A.S. Davydov, L.M. Dedukh, V.I. Nikitenko, A.S. Kovalev, A.M. Kosevich, V.G. Makhankov, V.K. Fedyanin, M.V. Chetkin. "Nonlinear Particle-Like Excitations Are a New Type of Collective Excitations in Ordered Media." (A series of works.)

Submitted by the Joint Institute for Nuclear Research and the Institute of Metal Physics of the Ukrainian SSR Academy of Sciences.

5. L.M. Barkov, S.I. Mishnev, A.P. Onuchin, V.V. Petrov, I.Ya. Protopopov, V.A. Sidorov, A.N. Skrinskiy, V.P. Smakhtin, Yu.A. Tikhonov, G.M. Tumaykin, Yu.M. Shatunov, L.M. Kurdadze. "The Precision Measurement of the Masses of Elementary Particles in Colliding Electron-Positron Beams." (A series of works.)

Submitted by the Institute of Nuclear Physics of the Siberian Department of the USSR Academy of Sciences.

6. V.I. Bredikhin, V.P. Yershov, V.I. Katsman, L.A. Lavrov, A.I. Zaretskiy, L.N. Rashkovich, V.A. Serebryakov, O.M. Smirnova, A.A. Chernov, Ye.A. Shkurenko. "The Development of a Method of the Rapid Growing of Large Nonlinear and Electro-Optical Crystals for Laser Equipment From Low-Temperature Aqueous Solutions—The Physical Principles, Equipment, and Technology."

Submitted by the Institute of Applied Physics of the USSR Academy of Sciences.

7. N.N. Gorkavyy, A.M. Fridman. "The Prediction of the System of New Satellites of Uranus on the Basis of the Developed Theory of Collective and Collision Processes in the Rings of Planets." (A series of works.)

Submitted by the Astronomy Council of the USSR Academy of Sciences.

8. Ye.V. Zharikov, V.G. Ostroumov, V.A. Smirnov, I.A. Shcherbakov, M.Kh. Ashurov, P. Khabibullayev, V.M. Kotov, I.I. Kuratev, A.V. Shestakov, V.G. Yanchuk, A.P. Shkadarevich. "The Development and Introduction in Series Production of Crystals of Chrome-Containing Scandium Garnets for Instruments of Quantum Electronics."

Submitted by the Institute of General Physics of the USSR Academy of Sciences.

9. R.L. Sorochenko, I.I. Berulis, A.Ye. Salomonovich, G.T. Smirnov, E.V. Borodzich, A.F. Dravskikh, Z.V. Dravskikh, N.S. Kardashev, A.A. Konovalenko, L.G. Sodin, Ye.Ye. Lekht. "The Discovery and Study of Radio-Frequency Spectral Lines of Highly Excited Atoms (Recombination Radio-Frequency Lines)." (A series of works.)

Submitted by the Institute of Physics imeni P.N. Lebedev of the USSR Academy of Sciences.

10. I.B. Khaybullin, Ye.I. Shtyrkov, M.M. Zaripov, M.F. Galyautdinov, R.M. Bayazitov, L.S. Smirnov, G.A. Kachurin, A.V. Dvurechenskiy, L.N. Aleksandrov, Yu.V. Kovalchuk, Yu.V. Pogorelskiy, Yu.V. Kopayev. "The Discovery and Study of the Phenomenon of Pulsed Oriented Crystallization ('Laser Annealing') and the Development on Its Basis of the Physical Principles of the Pulse Modification of Semiconductor Materials and Structures." (A series of works.)

Submitted by the Kazan Physical Technical Institute imeni Ye.K. Zavoyskiy of the Kazan Affiliate of the USSR Academy of Sciences.

11. A.A. Dezin. "Obshchiye voprosy teorii granichnykh zadach" [General Questions of the Theory of Boundary Problems]. (Monograph, Moscow, "Nauka", 1980.)

Submitted by the Institute of Mathematics imeni V.A. Steklov of the USSR Academy of Sciences.

12. M.M. Dzhrbashyan. "The Theory of the Factorization of Meromorphic Functions and the Theory of Harmonic Analysis in a Complex Region and Its Applications." (A series of works.)

Submitted by the Institute of Mathematics of the Armenian SSR Academy of Sciences.

13. Yu.V. Yegorov, V.A. Kondratyev, O.A. Oleynik, L.D. Kudryavtsev. "Studies of Boundary Problems for Differential Operators and Their Applications in Mathematical Physics." (A series of works.)

Submitted by the Mechanics and Mathematics Faculty of Moscow State University imeni M.V. Lomonosov and the Institute of Mathematics imeni V.A. Steklov of the USSR Academy of Sciences.

14. L.S. Pontryagin, V.I. Blagodatskikh, M.S. Nikolskiy, N.L. Grigorenko, A.S. Mishchenko, A.F. Filippov. "Nonclassical Problems of Control Theory." (A series of works.)

Submitted by the Institute of Mathematics imeni V.A. Steklov of the USSR Academy of Sciences and the Computational Mathematics and Cybernetics Faculty of Moscow State University imeni M.V. Lomonosov.

15. A.N. Baraboshkin, L.Ye. Ivanovskiy, N.G. Ilyushchenko, V.Ya. Kudyakov, V.N. Nekrasov, I.N. Ozeryanaya, N.A. Saltykova, M.V. Smirnov, V.P. Stepanov, V.A. Khokhlov. "The Development of the Principles of the Modern Physical Chemistry and Electrochemistry of Fused Electrolytes." (A series of works.)

Submitted by the Ural Department of the USSR Academy of Sciences.

16. V.A. Benderskiy, O.Ya. Grinberg, Ya.S. Lebedev, O.Ye. Yakimchenko, S.A. Dzyuba, S.A. Dikanov, A.D. Milov, A.M. Raytsimring, Yu.D. Tsvetkov, A.A. Dubinskiy. "Chemical Electron Paramagnetic Resonance Spectroscopy of High Time, Space, and Frequency Resolution." (A series of works.)

Submitted by the Institute of Chemical Kinetics and Combustion of the Siberian Department of the USSR Academy of Sciences.

17. M.A. Blokhin, N.F. Losev, Sh.I. Duymakayev, Yu.I. Velichko, V.P. Afonin, T.N. Gunicheva, A.N. Smagunova, G.V. Pavlinskiy, A.G. Revenko. "The Theoretical Principles and Methods of the X-Ray Fluorescent Analysis of the Chemical Composition of Substances and Materials." (A series of works.)

Submitted by Rostov State University imeni M.A. Suslov.

18. A.V. Bogatskiy, N.G. Lukyanenko, A.I. Gren, K.B. Yatsimirskiy, Yu.A. Zolotov, T.I. Malinovskiy, Yu.A. Simonov, V.V. Yakshin, V.M. Dziomko, O.V. Ivanov, V.V. Bykhov, S.A. Kotlyar. "The Development of Methods of the Synthesis, the Study of the Structure and Properties, and the Organization of the Industrial Production of Crown Ethers and Their Analogs."

Submitted by the Institute of Physical Chemistry imeni A.V. Bogatskiy of the Ukrainian SSR Academy of Sciences.

19. G.V. Vinogradov. "Fundamental Problems of the Rheology of Dispersed and Polymer Systems." (A series of works.)

Submitted by the Institute of Petrochemical Synthesis imeni A.V. Topchiyev of the USSR Academy of Sciences.

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Submitted by the USSR State Committee for Vocational and Technical Education.

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7807

Lomonosov Medals Awarded to A.M. Prokhorov, J. Bardeen

18140228 Moscow IZVESTIYA in Russian 12 Feb 88 p 2

[Article: "The M.V. Lomonosov Medals"]

[Text] The Presidium of the USSR Academy of Sciences has awarded the M.V. Lomonosov Gold Medals for 1987 to Academician A.M. Prokhorov for outstanding achievements in the field of physics and Professor J. Bardeen (the United States) for outstanding achievements in the field of physics.

The M.V. Lomonosov Gold Medals are the highest award of the USSR Academy of Sciences and are awarded annually (one to a Soviet scientist, one to a foreign scientist) for outstanding achievements in the natural sciences.

Academician Aleksandr Mikhaylovich Prokhorov is a distinguished Soviet physicist and one of the founders of quantum electronics—a field of physics, which has led to the development of a fundamentally new type of generators and accelerators of electromagnetic radiation—masers and lasers—and has had a revolutionizing influence on the development of modern physics, chemistry, engineering, and technology. His constructive ideas and methods have made a fundamental contribution to the development of modern knowledge in a number of sections of radiophysics, solid-state physics, spectroscopy, and the physics of magnetic phenomena.

In his first theoretical and experimental works, which were completed in the 1940's, A.M. Prokhorov obtained a number of important results: he developed the theory of linear oscillations as applied to the problem of stabilizing the frequency of a vacuum-tube oscillator, for the first time established experimentally the coherence of the microwave radiation of electrons in a synchrotron, and advanced the idea of the possibility of developing a molecular oscillator—a new type of generator of electromagnetic oscillations, which is based on the stimulated radiation of molecules.

A fundamentally important contribution to the formation and development of quantum electronics belongs to A.M. Prokhorov: in pioneering works of the 1950's he developed the theory of a molecular oscillator, devised the first microwave quantum-mechanical oscillator on a beam of ammonia molecules, and proposed the method of auxiliary radiation (pumping).

The basic research of A.M. Prokhorov, which led to the development of a fundamentally new class of low-noise microwave amplifiers—quantum amplifiers on paramagnetic crystals, and then quantum-mechanical oscillators of the optical band—lasers, is of decisive importance for the development of quantum electronics.

In the series of these works the implementation of the idea of A.M. Prokhorov of using ruby crystals as the active substance of masers and the suggestion on a new type of resonator—the open resonator—are of particular importance.

On the initiative of A.M. Prokhorov research in the field of fiber optics, microelectronics, laser spectroscopy and submillimeter spectroscopy, and hydrophysics and in various technological applications of lasers is being developed intensively and successfully at the Institute of General Physics of the USSR Academy of Sciences, which was established and is directed by him.

Academician A.M. Prokhorov is devoting much attention to the organization of science in the USSR and to questions of the international cooperation of scientists, being a member of the Presidium of the USSR Academy of Sciences and academician secretary of the General Physics and Astronomy Department of the USSR Academy of Sciences and in the position of editor in chief of "Bolshaya Sovetskaya Entsiklopediya" [The Great Soviet Encyclopedia].

The outstanding scientific services of Academician A.M. Prokhorov have received world recognition. He has been elected a member of foreign scientific societies and academies and an honorary doctor of foreign universities.

For basic research in the field of quantum electronics A.M. Prokhorov was awarded the Lenin and Nobel Prizes, while for works in the field of submillimeter spectroscopy he was awarded the USSR State Prize.

He is twice a Hero of Socialist Labor and has been awarded five Orders of Lenin.

John Bardeen, a physics professor of the University of Illinois (the United States), is a prominent American scientist, who has received world recognition for discoveries in the field of solid-state and semiconductor physics, which played a basic role in the development of 20th century physics and technology.

J. Bardeen was born in 1908 in Madison (the United States). He received a higher education at the University of Wisconsin and Princeton University. The beginning of the scientific activity of J. Bardeen is linked with Harvard University and the University of Minnesota. J. Bardeen worked successively at a laboratory of the U.S. naval forces and at the research center of Bell Telephone. Since 1951 the scientific activity of J. Bardeen has been connected entirely with the University of Illinois at Urbana (Illinois).

Outstanding achievements in the study of semiconductors are connected with the name of J. Bardeen. The discovery of the transistor effect and the development of the crystal transistor with point contacts—the first semiconductor transistor—belong to him.

For this discovery, which served as the basis of a scientific and technical revolution in radioelectronics and electronic engineering, J. Bardeen was awarded the 1956 Nobel Prize in physics.

The theoretical works of J. Bardeen, which were written in the middle of the 1950's, were of landmark importance in the development of present notions in the field of superconductivity. The theory suggested by J. Bardeen, which clarifies the microscopic mechanism of superconductivity, provided a qualitative explanation of

experimental facts and stimulated the rapid development of new theoretical and experimental operations, which promise to bring about a revolution in many vitally important fields of modern scientific knowledge.

The scientific contribution of J. Bardeen to the formation of the theory of superconductivity was commended by the awarding to him of a second Nobel Prize in physics in 1972.

The election of J. Bardeen as a member of a number of national academies and scientific societies and an honorary doctor of many universities is evidence of the outstanding scientific achievements of Professor J. Bardeen and his great prestige in world science. J. Bardeen has been awarded many national awards and prizes named after distinguished scientists. In 1982 Professor J. Bardeen was elected a foreign member of the USSR Academy of Sciences.

7807

Suggested Upgrading of Lenin Prize by Reducing Candidates' Number

18140247a Moscow IZVESTIYA in Russian 17 Mar 88 p 3

[Article by Academician Zh. Alferov, director of the Physico-Technical Institute imeni A.F. Ioffe, Leningrad: "How to Award Lenin Prizes"]

[Text] In the years that we now call stagnant, a devaluation of high titles and rewards took place. The prestige of state prizes waned and markedly fell in the eyes of the public. Circumstantial considerations and an ardent desire to please people in high places sometimes assumed the ascendancy even in nomination of candidates for the competition for the most respected prize in the country—the Lenin Prize. Fortunately, two circumstances prevented a precipitous drop in its prestige. The first is that it is awarded to a person only once in his life, and no one has yet succeeded in violating this set rule and becoming a winner at least twice. The second is that candidates for it have always been much fewer than for the state prize.

Does this mean that the Lenin-Prize statute does not need any corrections or changes? Not at all. From my point of view, it possesses all the defects characteristic of the statute on state prizes. They simply are not so obviously expressed.

The numerical structure of the authors' collective seems extremely important to me. In distinction to the State Prize where its limit is 12 persons, a collective half that large—6 persons—is permitted to compete. In my opinion, even this figure is also too large, in any case for works in the field of science. The experience of international prizes, verified over many decades of scientific practice shows that a reasonable level to the authors' collective is 3 persons, and not more. It is difficult to imagine that 6 scientists could be full-fledged authors of a discovery or a very important invention. On the other hand, conflicting situations in the determination of candidates arise most frequently in those cases where the number of competitors reaches a level that is maximally permissible according to the rules.

At the same time, the boundary line between real creative participation and basic contribution to a work is being eroded. Often local patriotism is in operation: although true authors can be counted on the fingers of one hand, the administrators of an institute or some other scientific institution try to fill all vacancies—for them it is more prestigious to receive six medals rather than one or two. After all, one begins to forget with the years how many works in this institution were singled out by a prize, but every one remembers how many prize winners are here.

A brief digression. This year gold medals imeni M.V. Lomonosov were received by Aleksandr Mikhaylovich Prokhorov and Dzhon Bardin, one of the greatest physicists of modern times and the only scientist who has been awarded two Nobel prizes in one field of science.

I know Dzhon Bardin a long time. I met him at Illinois University almost 20 years ago. Of course, I would have liked to be the first one to congratulate this remarkable scientist. A business trip to the United States made this possible.

In an interview by a local newspaper, the scientist said that he particularly esteemed the award since it is conferred by the USSR Academy of Sciences and he considers himself to be an follower of the Soviet school of theoretical physics, especially Landau's school. But when we met and I explained that the Lomonosov gold medal marks the highest level of recognition of scientific services, Bardin immediately asked the question: "Who received it before me?"

Actually, the prestige and significance of a scientific award depends to a large extent on whom it was previously conferred. The Lenin Prize is a special case. Still.... The years pass, and it turns out that among its winners quite average scientists are mentioned who have in no way shown themselves to be first rate in science, neither before nor after. Only a lucky concurrence of circumstances permitted them to find themselves a single time in the same row with people of truly great talent.

I am deeply convinced that the probability of finding oneself among casual authors and second-rate candidates will be unavoidable until the number of competitors is reduced to three persons.

The size of the monetary reward according to today's standards or compared to others with much less prestigious payment is too small. But it is considered improper

for some reason or other to refer to this aloud. We are hesitant to say the truth: the top national prize should be the highest in all its respects.

Once in order to boost higher the prestige of Lenin Prizes, it was decided to award them once in 2 years. This measure does not appear justified. Prizes of such a high rank ought to be yearly. Besides, in the field of science (and possibly not just in it), it would be advantageous to set up a prize for physics, for chemistry, for biology and so on. Without attempting to determine at this time the degree of importance of different fields of knowledge, we need to think which of them should be combined and which ones to be singled out individually. But it is clear that the reputation of the award and its prestige grow sharply when it is single. Let us say that the Lenin Prize for mathematics in 1988 would have an important ring and would be an extraordinarily high honor for a scientist.

People might say: it is unlikely for worthwhile works to appear every year. Well, we are not in a hurry, we can wait until they do appear. We will not even be upset in the instance when some year will be fruitful for major inventions and discoveries, for example, in chemistry or physics. Nothing is more terrible than for something to remain in a stockpile. It would be better to give the prize later than to award it for low-level work.

In the history of Soviet science, Stalin Prize winners should be remembered for all time not because they were prize winners but because their achievements received recognition both in our country and in the whole world.

7697

Economic Stimulation of Introduction of New Equipment

18140191a Moscow TEKHNIKA I NAUKA in Russian No 11, Nov 87 pp 16-17

[Article by Candidates of Economic Sciences Ye.A. Lavrentyeva and S.V. Chernyavskiy under the rubric "The Economics Faculty:" "Why Are They Not Introducing New Equipment?"]

[Text] But indeed, why? It would seem that there should not be problems here. The improvement of the quality of the output being produced, the increase of labor productivity, and the increase of production volumes in many respects depend on new equipment. Nevertheless practice shows that up to now enterprises have not been pursuing new equipment.

Significant specific expenditures, after which an immediate return cannot follow, are required for the assimilation of new equipment.

The unified fund for the development of science and technology (YeFRNT) was established in the majority of sectors of industry for the compensation of the indicated expenditures. It was formed by deductions from the profit of subordinate enterprises and associations.

It would seem that all obstacles in the way of the introduction of new equipment had been removed—for the enterprise no longer bears the burden of the additional expenses of the period of its assimilation. But that is not how it turned out.

Production as before remains unreceptive to scientific and technical innovations. But is the reason for the "rejection" of innovations, perhaps, in something else? Let us reflect on this. Specialists, who are engaged in development or introduction, do not participate in the output of commodity production. On the contrary, they have a negative impact on the indicators of realization, labor productivity, and the profit. Often this leads to the upsetting of the fulfillment of the plan on deliveries in accordance with concluded contract. In addition to all that the introduction of new equipment, which is paid for from the unified fund for the development of science and technology, is not included in the volume of the commodity and sold output and the enterprise does not receive a profit for it.

As a result the enterprise, if it does perform work on the introduction of new equipment, most often tries not to put it in the reporting, but takes it into accounting in the price of the product being developed, which, of course, increases it.

How is the formed situation to be overcome?

The following means is actually possible. So that the entire system of economic stimulation for the basic results of activity would begin to work for scientific and technical progress, it is necessary to give the introduction of new equipment equal rights with the output of ordinary products. Such an approach, which takes into account the cost accounting interests of the enterprise, will ensure the same profitability of the introduction of new equipment and technology as the output of a series-produced product.

This situation can be ensured, if the expenditures on the assimilation of new equipment, technology, and items, which are specified in the estimate, are taken into account in the total volume of output of the enterprise and are increased in so doing by the standard profit. The cost of such work should be taken into account in the planned and actual volumes of the sale of products, and only then will there be formed for the enterprise a profit, which the work on the introduction of scientific and technical innovations will yield it.

It is impossible to say that the foregoing became well known only now. All the necessary steps of economic influence on the interests of enterprises, which introduce new equipment, were envisaged by the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1985, "On the Extensive Dissemination of New Methods of Management and the Increase of Their Influence on the Acceleration of Scientific and Technical Progress." Paragraph 4 of the decree orders the value of the work, which was paid for from the unified fund for the development of science and technology, to be included in the volume of sold output. It is proposed to take into account the failure to fulfill the assignments on the introduction of new equipment when estimating the sale of products, on the basis of the obligations on their deliveries in conformity with concluded contracts.

However, all these decisions simply remained on paper.

Since 1 January 1987 several union ministries, as well as individual associations and enterprises have been working under the conditions of self-financing. This means that given the gradual making of the conditions of budget financing stricter the enterprise itself should earn monetary assets for the covering of its current and capital outlays. The fund for the development of production, science, and technology (FRPNT), which unites the assets of two funds—the unified fund for the development of science and technology and the production development fund (one of the three economic stimulation funds)—is the basic source of financing of the introduction of new equipment and technology under these conditions.

Thus, great independence has been granted to each enterprise in the spending of assets for the financing of measures on the introduction of new equipment. Only the centralized financing of scientific research and experimental design work of a general sectorial nature is being retained. However, now an appreciable increase of the interest of enterprises in introducing new equipment and

technology and in updating and improving the quality of the output being produced is also not occurring. It turned out that the enterprise can also financing itself quite successfully under the new conditions of management.

First of all, the practically complete lack of interest of enterprises in the introduction of innovations is, as before, the original cause of this. This, as was already noted, merely complicates for it the fulfillment of the plan on the basic indicators, including the profit.

Corresponding Member of the USSR Academy of Sciences P.G. Bunich in works of recent times repeatedly noted that under the conditions of self-financing it is more correct to grant the right of the distribution of the cost accounting income (that is, the receipts from sales less material expenditures, obligations to the budget, and interest to the bank for credit) to the enterprise itself. That is, the enterprise should itself determine what portion of the cost accounting revenue should assume the form of the profit, and what portion should assume the form of the wage. However, P.G. Bunich quite correctly believes that at present the enterprise is not yet ready for such distribution. The interests of today will determine the proportions. That is, the real possibility exists that nearly all the cost accounting revenue will be transferred to the form of the wage (for its increase).

The same thing is also correct for new equipment. For the expenditures on its introduction must be made today, the indicators of work will also worsen today, while there will be a return (profit) only some time later. Thus, self-financing in pure form, which is not supported by any economic steps, does not solve the problem of the introduction of achievements.

Moreover, the fact that cost accounting in its present form has not yet been brought to a logical conclusion, also undermines the idea of increasing the interest of enterprises in updating their production on the basis of a new pool of machines and equipment. Indeed, the centralized distribution of means of production, which is also being retained under self-financing, and the absence of wholesale trade in means of production and a real opportunity for the enterprise to "back with goods" the resources at its disposal do not ensure and cannot ensure an interest of the enterprise in the introduction of new equipment.

The creation of the most favorable conditions for the introduction of new equipment at enterprises involves the changeover to wholesale trade in means of production (moreover, all the steps examined above should actually begin to have an effect in economic practice). Only then, under the conditions of genuine cost accounting and self-financing, will the enterprise, in having the right to choose the supplier of equipment, approach its acquisition in a more demanding manner. This is on the one hand. On the other, being a supplier of new equipment, for the assurance of the sale of its products the enterprise itself will be interested in introducing new items and technologies for the increase of the technical level of its own production.

7807

Decline of Prestige of Engineering Labor

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[Article by Doctor of Philosophical Sciences Professor V.F. Sbytov under the rubric "The Opinion of a Specialist": "Problems of the Social Prestige of the Engineer"]

[Text] In recent times the engineer has become the main hero of statements and discussions in the press and on radio and television, while his prestige has become the most urgent theme. And it is possible to speak without exaggeration about a critical situation. For it is a matter of a detachment of 15 million specialists with a higher and secondary specialized education, which is employed in the national economy and is called upon to become the key figure of the acceleration of scientific and technical progress.

The social prestige of engineering occupations in industrial sectors has declined especially sharply. The work of a specialist at a works has lost appeal for young people who have not yet chosen an occupation, for graduates of technical higher educational institutions, and, what is the primary thing, for engineering and technical personnel who are already employed at industrial enterprises. This process is cumulative: whereas among secondary school graduates the occupation of an engineer is in 2d place in prestige and among matriculants is in 5th place, according to the scale of young specialists it has moved to 15th-16th place.

According to the data of an all-union sociological study, which was conducted by the Institute of Sociological Research of the USSR Academy of Sciences, engineering labor in industry in appeal is relegated to last place among intellectual occupations, letting ahead even the traditionally unprestigious labor of specialists in agriculture.

Only engineers, who are managers of production collectives, consider their job close in appeal to creative occupations. But inasmuch as the proportion of this job group of engineering and technical personnel is small, it has a negligible influence on the overall appraisal. The attitude toward the occupation of an engineer at a works in general is formed in the consciousness of people from the negative perception of the work of rank and file engineers and foremen of shifts and production sections.

According to the data of the study, 26 percent of the graduates of technical higher educational institutions would like to begin their labor activity as designers or process engineers, 24 percent would like to begin it as foremen. Only 8 percent of those surveyed named the job of a foreman as a prestigious one. They see in the job of a foreman mainly negative things: 50 percent consider it "trying" and 25 percent consider it low paid. As a negative quality 15 percent noted the great responsibility, 37 percent are convinced that the job of a foreman involves the poor organization of labor, 25 percent note an abundance of duties of a nonproduction nature.

The low appraisal of the prestige of a rank and file engineer and foreman entails the instability of staffs of these specialists at enterprises. According to the data of the all-union sociological study, a quite significant portion of the surveyed representatives of the engineering and technical intelligentsia expressed their desire to transfer to another enterprise or to another sector of industry. Among them 18 percent are experienced workers, 20 percent are technicians, and 20 percent are foremen.

Discontent with work also leads to the occupational mobility of engineering and technical personnel. Only 44 percent of the mechanical engineers, 57 percent of the process engineers, and 66 percent of the electrical engineers work in the specialty acquired at a higher educational institution, while among physicians 91 percent are such and among instructors of natural science and exact science disciplines 81 percent are such.

Various opinions are being voiced in the debates on the factors which gave rise to these phenomena. The majority of them point to the low wage and the system of material and moral stimulation as a whole. Another portion of the opinions names as a cause unsatisfactory training at the higher school, the overproduction of engineers, the poor organization of their labor, and their use not in their specialty. There are also appraisals, I would say, of a psychological nature—the "social passivity" of engineering personnel and their "schematic thinking," which suffers from an "inferiority complex."

Of course, all these opinions reflect individual aspects of the process, which emerged about 2 decades ago and is connected with important shortcomings in social production. The status of engineering and technical personnel and the decrease of the social significance of their labor reflect the consequences of an extensively developing economy and the changes in the set of values, which affected all strata of our society without exception.

Indeed, a significant gap formed between the declared and real values. The necessity of innovations was constantly proclaimed loudly, the role of the engineer at the works and the achievements of the Soviet higher school were spoken about, but in practice the increased bureaucratization of the management of social production became the basic hindrance to the efficient labor of engineers. The prevailing economic mechanism not only did not stimulate creative engineering thought, but also created an insurmountable barrier for innovation by numerous prohibitive instructions, statutes, and so on.

As a result of bureaucratic machinations a set of indicators, which worked for the extensive development of production and simulated its well-being, was formed. The lack for more than 2 decades in social production of a developed need for innovations and the expenditure system of economic and social indicators, it seems, are also a main cause of the decline of the social prestige of engineering labor. Of course, when such an indicator as the gross is in effect, production does not need innovations and, consequently, engineers in their true sense—as creators, developers of new equipment and technology. The detachment of innovations from the process of production and, hence, the alienation of engineering labor occurred. Precisely owing to this in the 1970's the engineer began to perform functions, which do not correspond to his skill and are not included in the group of his professional duties.

A table shows the engineering and technical personnel in the total number of production engineering intelligentsia (percent) and the engineering and technical personnel in the number of production personnel directly engaged in production (percent).

According to the data of sociological studies, young engineers of scientific research institutes spend 60 percent of the working time at low-skilled jobs, vegetable bases, kolkhozes, construction, as well as various public drives: voluntary people's patrols, sports competitions, volunteer ambulance squads, and so on. They spend a significant portion of the time on office and other work, for the ancillary services—the economic, patent, and technical information services and the bureau of standards—which were established at one time for the servicing of engineers, often do not conform to their immediate purpose. And engineers have become couriers, typists, accountants of the fulfillment of assignments of the competition, artists.... The incorrect organization of the service of the engineer intensified even more the decline of the prestige of engineering labor.

Then, as it turned out, such "zones" of engineering activity as technical documentation and technical equipment were forgotten. At the famous Krasnyy proletariy Plant state acceptance in 1986 rejected more than half of the NC machine tools. Here since the 1970's the technical documentation has not been compared against all-union state standards. This fact has been established at many enterprises, at which state acceptance has been introduced.

But will state acceptance commissions alone be able to settle the questions, with which entire technological services, shop divisions of the chief engineer, and other purely engineering subdivisions, which have been eliminated in recent years, dealt?

But to what a level we have reduced the very concept "engineer"! The number of engineer-"snowdrops" is enormous. Former inspectors for personnel and for labor and wages and supply agents are called engineers. There are even landscape engineers, rate setting engineers, and tens of other hyphenated names. But engineers by "position" often do not have even a secondary technical education.

In introducing these titles, did the workers of the State Committee for Labor and Social Problems and ministries really not display, to put it mildly, contempt for the title of a engineer? It would probably never occur to anyone to say, for example, "actor for supply" or "physician for personnel."

A table shows the medical intelligentsia; intelligenstia of the service sphere; scientific, pedagogical, and creative intelligentsia; specialists employed at enterprises and organizations of construction, transportation, and communications; management intelligentsia; agricultural intelligentsia; and engineering and technical intelligentsia.

Owing to all these official tricks engineers "in essence" were dissolved among "staff" engineers. In this situation to restore the prestige of the engineer means to return to the engineer what is the engineer's.

As the results of all-union sociological studies show, among engineers with a higher education only 60 percent are being used in conformity with the acquired specialty. On the average about a third of all the surveyed graduate engineers are engaged in complex mental labor, while only 10 percent are engaged in creative engineering work as such. About half of the engineers are performing work, which in content does not meet the demands on engineering labor.

The bulk of the surveyed engineers are engaged in the support of the operation of equipment (25 percent) and the organizational management system (55 percent). In all 20 percent act as immediate organizers and managers of production. At the same time about 80 percent of the surveyed specialists are displaying a great interest in the independent solution of their own engineering problems.

Thus, the orientation of the engineer toward the development of new equipment and technology and toward its introduction in production is characteristic only to the smallest degree of modern industrial production in the country. The inefficient use of engineering labor leads to enormous economic and social losses, not to mention the erosion of its moral potential.

Among engineers the motivation of the constant increase of their skills has been deformed. Whereas in the early 1970's production necessity was the basic reason for the increase of skills and education and a gauge of the status of the engineer, in 1985 follow-up studies showed that social prestige and the broadening of one's outlook, which in fact are not directly connected with production necessity and with the attitude toward labor in general, had become the basic reason.

During the period of the conducting of the all-union sociological study only 14 percent of the specialists employed at industrial enterprises, mainly rank and file engineers and foremen, were studying in courses or at faculties for the improvement of skills. In all 7 percent of the specialists were studying in evening and correspondence departments, moreover, of them 9 percent were rank and file engineers and only 6 percent were managers of the highest level.

A table shows the index "level of education" points for those who plan to continue studies (percent) of the rank and file engineering and technical personnel, foremen, chiefs of shops, chief specialists, directors, and their deputies.

A table shows those who plan to transfer to another enterprise and those who plan to acquire a new specialty (percent) of the rank and file engineering and technical personnel, foremen, senior foremen, chiefs of shops, chief specialists, directors, and their deputies.

The analysis of the negative attitude toward the improvement of skills showed that the majority of engineers consider their level to conform completely to the job. Many believe that it is already too late to learn. Mainly women having children cited family circumstances.

The aspiration to participate in production management was the main reason for the increase of education in all skills groups. The desire to meet the requirements of work with new equipment and the aspiration for more interesting, creative work also held a high place in the hierarchy of reasons. There is a regularity: the higher the level of education a person has, the greater degree to which he strives to acquire new knowledge.

Among the engineering and technical personnel of industry 19 percent of those surveyed regularly turn to literature in their specialty, 41 percent do so often, 30 percent do so rarely, and 11 percent practically never do so. So that self-education would blend fundamentally with the set of forms and methods of the continuous education of engineers, its stimulation on the part of the state, first of all by certification, is needed.

The statistical and sociological analysis testifies that our national economy lacks "culture" and, first of all, education. Indeed, the potential of education, about which V.I. Lenin urgently spoke in his day. "The lack of culture" in the sphere of production, labor, management, and economics and in the social sphere is a source of various troubles of ours.

A table shows the number of men, women, technicians, designers, rate setters, engineers, foremen, and production controllers and the average age (years) of rank and file engineering and technical personnel, managers of level 1, managers of level 2, and managers of level 3.

In mass consciousness the notion of the engineer as "a poor man" has taken root. Simple physical labor has begun to be paid better than difficult mental labor. The economic law, in conformity with which difficult labor is simple labor, which has been raised to a power or multiplied, has thereby been violated. In practice this means that material stimuli of the quality of labor have lost their meaning, while the leveling trends in the sphere of economics have become a social fact and have increased the injustice with respect to an enormous social group. As a result more than 3 million engineers and technicians have transferred to worker positions.

Today, judging from the data of the study "Specialists of Moscow-86," rank and file engineers receive on the average 141 rubles a month, while a manager of all ranks receives 205 rubles. It must be said that as compared with personnel of science, health care, and art their pay is higher, while their prestige all the same is lower. Because the social range, that is, the possibility of job promotion within an occupation, also has an influence on the formation of prestige.

Such steps as the partial increase of the wage, recertification, the auditing of workplaces, and the like can be considered "cosmetic," and they do not solve the problem as a whole.

Engineers must be dealt with in earnest. About 6 million graduate engineers are employed in the national economy of the country, but there is not one engineering organization which would represent the interests of this social group. Trade unions, despite their name, unite people not according to the occupational principle, but according to the sectorial principle. The All-Union Council of Scientific and Technical Societies is not playing the large role which the Russian Technical Society once played. In the 1920's engineers also had their own professional societies, engineering and technical sections within trade unions, and five specialized journals. Today even preferential travel authorizations are not been offered to them. But engineers, as never before, need today representation and the protection of their interests.

The decline of the prestige of engineering labor is fraught with long-term negative consequences. The lack of competitions for technical higher educational institutions and tekhnikums and the large competitions for educational institutions of the service sphere and trade have for a long time now testified to this. Such a reorientation of consciousness can do irreparable harm to the scientific and technical potential of the country.

7807

Interaction of Science, Production in Sectors

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[Article by Candidate of Economic Sciences Nikolay Alekhin and Candidate of Economic Sciences Yelena Lenchuk, the Institute of Economics of the World Socialist System of the USSR Academy of Sciences, under the rubric "The Sharing of Experience:" "New Forms of the Sectorial Interaction of Science and Production in the USSR"]

[Text]

"From the Idea to the Series"

One of the characteristic traits of the present stage of the scientific and technical revolution is the increasing need for the establishment of close organizational and economic ties of science with production, which is becoming one of the main conditions of the economically highly efficient materialization of scientific and technical achievements. Today the shortening of the time of their assimilation is all but the most important reserve of the increase of the economic efficiency of science. As is known, the total expenditures on the bringing of developments up to series applicability exceed by many fold the spending on scientific and technical research. The significantly more rapid increase of the expenditures on the industrial assimilation of scientific and technical ideas than on their generation is being noted everywhere in the world.

The general global trend toward the increased fusion of science with production naturally dictated the search for and use of various organizational forms of the management of the development and assimilation of new equipment and technology. This process is especially complex in case of the solution of important national economic scientific and technical problems, when it is necessary to achieve the systematic coordinated interaction of large potentials in specific scientific directions with a number of sectors of industry, which are related, but often also very different in the nature of production.

The implementation of promising ideas of modern basic science more and more often poses the question of equipment, the development of which by individual sectors is impossible.

Hence the increase of the scale of the intersectorial cooperation of research and development in case of the devising of new equipment and technology. In the past decade new discoveries have been made, as a rule, at the meeting point of different fields of science. The appearance of such directions of science as information science, biochemistry, physical chemical mechanics, and so forth is becoming a visible expression of such a regularity.

Given such interdependence the acceleration of the pace of scientific and technical progress and the efficient use of its achievements in practice are possible only when a scientific problem is solved jointly and not individual types of machines and technologies, but an integrated technological system is developed. Precisely it is becoming a unit of the planning and management of scientific and technical progress.

It is quite natural that in this case the fulfillment of the posed tasks does not fit within the framework of the traditional sectorial organization of industry and is accompanied by difficulties due to the departmental isolation of the participants in scientific development. In order to overcome them and to give a wide road to the latest directions of equipment and to the most advanced technologies, which by nature are intersectorial, rather multisectorial, the development of the corresponding organizational forms is necessary.

Science and production in the CEMA member countries are being integrated by various means and methods subject to the scale of the scientific, technical, and production potentials, national traditions in science, the peculiarities of the structure of the economy, the mechanism of the management of the economy, and other things. At present an intensive search is under way for new principles and forms of the organization of scientific activity and production in order to achieve the coordinated interaction of both stages of reproduction.

Interbranch Scientific Technical Complexes: The Goals and Structure

In the USSR this vital problem is being solved, in particular, by the development of a system of state scientific economic associations, which are called interbranch scientific technical complexes (MNTK's). These structurally complex economic units are a new organizational form of the interaction of science, including basic science, with production. In essence, interbranch scientific technical complexes commenced a new stage in the search for means of the optimum realization of the cycle—from the scientific idea to introduction.

The formation of interbranch scientific technical complexes is an essential element of all restructuring of the economic mechanism in our country. In addition to accomplishing the naturally urgent task of the unification of science with production and their concentration on specific sections of scientific and technical progress the complexes are also called upon to sweep away the departmental barriers between individual sectors, which formed owing to a number of objective and subjective reasons. Most often the process of introduction is hampered precisely at the meeting point of sectors.

The first interbranch scientific technical complexes were established in late 1985 in the most important directions of modern science and technology. Among them are, in particular, the Robot, Katalizator, Tekhnologicheskiye lazery, Biogen, Rotor, Membrany, Nadezhnost mashin, and other interbranch scientific technical complexes. One should especially note the establishment of the Institut elektrosvarki imeni Ye.O. Patona Interbranch Scientific Technical Complex, in connection with the fact that a certain scientific technical complex with a powerful design and technological bureau, an experimental works, and pilot plants, in which a reliable chain of the passage of scientific and technical innovations from development to the production of a prototype operates, was actually formed on its basis back before being transformed into an interbranch scientific technical complex. As a result the Institute of Electric Welding of the Ukrainian SSR Academy of Sciences served to a certain extent as a model for the formation of the general structure of interbranch scientific technical complexes in their present form.

Given all the differences in the nature of the activity of interbranch scientific technical complexes the unified principle of the assurance of the comprehensive interconnection of science with production, which is not an end in itself, but an effective means of the acceleration of scientific and technical progress within interbranch scientific technical complexes and the increase in the end of the efficiency of all social production, was made the basis for the organizational structure of each of them.

During the current five-year plan in the USSR it is planned to obtain not less than two-thirds of the increase of the productivity of national labor by the efficient introduction of the achievements of science and technology, including those developed by interbranch scientific technical complexes. Various scientific and production collectives, which work in accordance with common annual and five-year plans, are united in it under one administrative management. They should support the entire cycle—from the scientific development to the assimilation of new equipment and technology. In other words, the interbranch scientific technical complex is a kind of scientific production conveyor for the materialization of scientific and technical innovations in modern science-intensive products.

The corresponding scientific or scientific and technical organization—an academic or sectorial institute, a large laboratory, a design bureau, and so on, which performs the role of the so-called main organization of the complex and gives it one scientific production profile or another, is the main structure-forming element of the interbranch scientific technical complex. Scientific research institutes, design bureaus, technological organizations, and production subdivisions in the form of enterprises, plants, individual pilot works, and other necessary organizations from various ministries and departments are included in the interbranch scientific technical complexes. Their composition is approved directly by the government.

The main organization acts with respect to the organizations and institutions, which are a part of the interbranch scientific technical complex, as the superior organ with

specific rights and duties. The interaction of all the units of the interbranch scientific technical complex is of a mandatory, directive nature.

Scientific research, design, and technological organizations regardless of their departmental affiliation can also be enlisted on a contractual basis in the activity of the interbranch scientific technical complex.

The establishment of the interbranch scientific technical complex required its scientific and economic supervision at a high level. The inclusion in the complex of organizations and enterprises from sectors of industry and departments with their simultaneous subordination to sectorial management makes it possible to unite more soundly the interests of this sector and other sectors and the national economy as a whole.

As a rule, the manager of the main organization of the interbranch scientific technical complex becomes its general director, who is appointed by the USSR Council of Ministers: today these are authoritative scientists and prominent organizers of science.

In conformity with such an organizational structure the fulfillment of the general task of the interbranch scientific technical complex is broken down into two interconnected stages. These are, first, "to do science," that is, the scientific, scientific and technical, and planning and design organizations, which belong to it, should be completely responsible for the preparation of a scientific idea for its large-scale introduction up to the production of a mockup and prototype and the drafting of the technical specifications. The second part of the task consists in the organization of the series output of equipment (products) with the use of new technology at the producer plants of the interbranch scientific technical complex. For the purpose of the rapid introduction of innovations, which have been developed at it, special engineering centers, which work on problems in individual, more narrow specific directions of technical progress, can be established in its staff.

As a result the significant acceleration of the passage of a scientific idea from its origination to extensive use in the national economy is achieved.

Assignments on the basic indicators of the activity of interbranch complexes and the production of new types of equipment, technology, and materials, which have been developed at interbranch scientific technical complexes, starting this year are being included in the drafts of the state plans of USSR economic and social development. In turn ministries and departments are reflecting these assignments in the plans of subordinate organizations and enterprises, allotting them the corresponding financial, manpower, material, and technical resources and limits of capital investments and planning, surveying, and contractual work.

There are included in the group of specific tasks of the interbranch scientific technical complex: the forecasting of the prospects of the development of research and the formulation of science and technology policy; the determination of the most effective means of solving the most important scientific and technical problems with the obtaining in the shortest possible time of practical results that are higher than the world level; the formulation on this basis for the drafts of state five-year plans of suggestions on the development in the country of the corresponding direction in science and technology, as well as drafts of long-range scientific and technical goal programs in connection with national economic tasks; the conducting on its own and the coordination for the country as a whole of basic and applied research and experimental design and technological work in conformity with the corresponding direction in science and technology, which is attached to the interbranch scientific technical complex; the production of prototypes of items and jointly with ministries and departments their bringing up to series production.

An important sphere of activity of the complexes is the provision of their structural subdivisions with highly skilled personnel.

For the accomplishment of these tasks the establishment of data banks, as well as stimulation funds is envisaged at interbranch scientific technical complexes.

For the purpose of increasing the economic interest of the collectives of the organizations and enterprises, which are a part of the complex, in the rapid development and assimilation of new equipment a centralized bonus fund is formed at the interbranch scientific technical complex. It is formed by means of a portion of the assets of interested ministries and departments, which are transferred by them from their centralized bonus funds, and a portion of the assets of the material incentive funds of both the organizations and enterprises of the complex and those which are participating in its work.

The fact that the bonuses for workers of the interbranch scientific technical complex will be issued only for the development and complete assimilation of new equipment, is fundamentally new in the use of the bonus fund.

Inasmuch as the activity of interbranch scientific technical complexes is oriented toward the development of fundamentally new equipment and technology, which are competitive on the world market, the increase of the technical equipment of research and the work on the development of prototypes of equipment, technology, and materials of new generations is assuming especially great importance. For this another centralized fund—the fund of currency receipts, which is formed by means of deductions from the assets, which have been received by enterprises and enterprises of the complexes and those participating in its work for the sale of their scientific and technical achievements—licenses, know-how, as

well as produced output, is formed at interbranch scientific technical complexes. A portion of the currency receipts, which have been received by outside organizations from the delivery for export of products that were produced in accordance with designs of interbranch scientific technical complexes, is another source of the replenishment of this fund.

Taking into account the great importance of the development being conducted at complexes, their uninterrupted material and technical supply is guaranteed.

The corresponding ministries and departments are obliged to settle promptly questions of the additional allocation to the complexes of material and technical resources, the need for which arises during the fulfillment of the established assignments.

The appropriate equipment of the pilot experimental base is an important demand on the material and technical supply of the interbranch scientific technical complex. Its capacity should ensure the checking of the results of research of the interbranch scientific technical complex for a period of not more than a year. The granting to interbranch scientific technical complexes of additional benefits in the assurance of the leasing of the units, instruments, and equipment, which are necessary for scientific research, in many respects is contributing to the fulfillment of these requirements.

Shortening the Cycle of Introduction

It should be said that interbranch scientific technical complexes are still at the beginning of their development and far from all aspects of their activity are clearly defined. As the first experience shows, the main goal of their establishment—the shortening of the cycle of the introduction and large-scale assimilation of scientific and technical innovations in the interests of the entire national economy—justifies itself. At present more than 20 interbranch scientific technical complexes are operating, several tens more are being formed. Interbranch scientific technical complexes are successfully launching activity on the setting up of multisectorial scientific production cooperation. In particular, the Rotor Interbranch Scientific Technical Complex with the main organization—the Experimental Scientific Research Institute of Metal-Cutting Machine Tools—was in charge of all the work on the development of robotized complexes and flexible production systems for the modernization of machining and assembly, which will yield a 1.5- to 2.5-fold increase of labor productivity.

The establishment of the Rotor Interbranch Scientific Technical Complex is providing a strong stimulus for the development of equipment which is important for many sectors. Our domestic invention—rotary and rotary conveyor lines, which were developed under the supervision of Academician L.N. Koshkin—is very promising for the mass production in automatic mode of many types of products. Rotary lines ensure the integrated mechanization of technological processes, at least half of the production area is saved, labor productivity increases by not less than fourfold.

The interbranch scientific technical complex, which was organized on the basis of the Institute of Electric Welding imeni Ye.O. Paton, has a powerful potential: scientific subdivisions, an experimental design and technological bureau, an experimental works, pilot plants of welding equipment and special metallurgy, as well as the Specialized Design and Technological Bureau for Explosion Metal Working with a pilot works. Now the complex has been strengthened by means of a number of scientific and production subdivisions of various ministries and departments. The task of developing a technology and equipment for welding, hard-facing, soldering, the application of coatings, and special electrometallurgy faces the interbranch scientific technical complex. As a result of the introduction of developments of the complex already during the 12th Five-Year Plan the country should save millions of tons of ferrous metals and conditionally free tens of thousands of workers.

There are directions, which need special attention and the quick uniting of uncoordinated efforts of individual institutes and design bureaus. Such a task, for example, faces the Personalnyye EVM Interbranch Scientific Technical Complex. A range of modern microcomputers has to be developed without delay at a high world level so that industry already during the current five-year plan would begin their production for mass use.

Among the established interbranch scientific technical complexes are the Svetovod Interbranch Scientific Technical Complex for the rapid development of fiber optics, the Biogen Interbranch Scientific Technical Complex, which is oriented toward the problems of biotechnology, the Tekhnologicheskiye lazery Interbranch Scientific Technical Complex for supplying the national economy with reliable technological lasers, and others.

These examples show that the first interbranch scientific technical complexes are intended for the solution of a quite broad range of problems. But the main thing is that the priority directions, the rapid development of which should ensure the quick advance of the entire national economy, are distinguished.

Aiding the Implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000

The activity of interbranch scientific technical complexes is not confined to the coordination of the work of scientific and production subdivisions within the country. They are called upon to play a significant role in the conducting and coordination of the basic research and development, which are envisaged by the Comprehensive Program of Scientific and Technical Progress of the

CEMA Member Countries to 2000 (KP NTP). Practically all the established interbranch scientific technical complexes are becoming the main organizations for the corresponding problems.

Despite the fact that interbranch scientific technical complexes are a new organizational form, the scientific and production subdivisions, which are a part of them, already have longstanding traditions in cooperation with the CEMA member countries. Thus, the contacts of the Experimental Scientific Research Institute of Metal-Cutting Machine Tools, on the basis of which the national Robot Interbranch Scientific Technical Complex was established, and the Bukov Scientific Institute of Metal Working Machine Tools (the CSSR) served as the basis for the formation in March 1985 of the first Soviet-Czechoslovak scientific technical association for robotics, which received the name Robot. In the short time of its existence the introduction of robots and automatic manipulators in CSSR machine building production has been sped up, and their number has been increased to 3,500. In conformity with the program of scientific research, design, planning, and technological work and production of the Robot Association for 1986-1990 the development and production of 5 types of automated equipment, 12 types of industrial robots and manipulators, and 26 types of robotized sections will be organized by the joint efforts of Soviet and Czechoslovak specialists. At present the Soviet-Czechoslovak scientific technical association and the Soviet interbranch scientific technical complex are immediate participants in the Interrobot International Scientific Technical Complex, which was founded at the 41st (extraordinary) meeting of the CEMA Session.

The questions of the functions of interbranch scientific technical complexes in foreign economic activity are being settled in a new way. Like all other main organizations for the most important problems of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, they have been given the right to conclude economic agreements and contracts with partners from other CEMA member countries, including ones of a commercial nature, and to carry out the reciprocal transfer of joint work. In other words, all the prerequisites are being created for the setting up of direct ties of interbranch scientific technical complexes with organizations which are the coperformers of assignments on the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000.

Thus, the activity of interbranch scientific technical complexes is aimed at the rapid solution of the most important problems of scientific and technical progress not only in the USSR, but also in the entire socialist community. Therefore, it is especially important to increase the efficiency, promptitude, and smoothness of the work of all the units of interbranch scientific technical complexes.

The Means of Improvement

A little more than a year has passed since the establishment of interbranch scientific technical complexes. Of course, in so short a time they could not yet ensure the accomplishment of all the most difficult tasks which face them.

Although the fundamental questions of the organization of the activity of interbranch scientific technical complexes are clear today, the model statute on their activity, undoubtedly, needs refinements. The economic aspects in the management of the complexes, which would be able to work efficiently, if the real contacts of academic and sectorial scientific research institutes with industry, which are based on administrative subordination and the enthusiasm of separate individuals, were supplemented by their great economic interest, are assuming great importance. In this connection it seems advisable to study the possibilities of establishing a special-purpose development fund of the interbranch scientific technical complex for the financing of all work in accordance with the unified plan of the complex. This fund would serve as a powerful lever of the pursuit of a unified technical policy by the main organization of the interbranch scientific technical complex by the granting to it of the right to finance or to halt at its discretion the corresponding types of scientific research and experimental design work.

Moreover, the structure of the interbranch scientific technical complexes, which are being established, should have a certain flexibility and make it possible to enlist in scientific development enterprises and institutions, which organizationally are not a part of them. An important direction of the activity of the interbranch scientific technical complex is the determination of the economic forms of its interaction and that of scientific research institutes and enterprises, including higher educational institutions.

These and other questions, which are arising in the activity of interbranch scientific technical complexes, will undoubtedly be settled, and the new forms of intersectorial scientific production cooperation will take an important place in the structure of the USSR national economy.

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Development, Reform of System of Standardization

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[Article by Doctor of Technical Sciences G.D. Kolmogorov, chairman of the USSR State Committee for Standards: "Serve the Ideals of October"]

[Text] The 70th anniversary of the Great October Socialist Revolution is a most important milestone in the history of our country. In celebrating this anniversary

under the conditions of restructuring, we are trying to check our deeds against the great goals of the socialist revolution, attempting in the process of an object historical analysis to understand what has been done and what still has to be done for the real embodiment of the ideals of October. Here we are examining every area of activity in the process of development and in interconnection with the basic milestones of the history of the country. Standardization also does not constitute an exception.

Standardization Yesterday and Today

The history of Soviet standardization, of which 15 September 1925—the date of the establishment of the Committee for Standardization attached to the Council of Labor and Defense—is considered the beginning, actually begins earlier. Its sources come from Lenin's idea that "socialism is inconceivable without big capitalist equipment, which has been built according to the latest word of the newest science, without systematic state organization, which subordinates tens of millions of people to the strictest observance of a single norm in the matter of the production and distribution of products."[1] In this repeatedly quoted statement I would like to emphasis that V.I. Lenin links the introduction of a single norm with two mandatory conditions of the existence of socialism: the building of advanced equipment and systematic state organization. Therefore, at all stages of the building of socialism standardization was used not by chance as an effective tool of the accomplishment of the difficult and responsible tasks of the formation and development of the Soviet economy.

In the 1920's standardization helped to combat dislocation. Thus, by the strict standardization of the technical parameters of parts and assemblies, which is necessary for the assurance of their interchangeability, it was possible to set up the repair of worn out machines and mechanisms and to create favorable conditions for the specialization and cooperation of their large-series production. Standards become a means of the establishment of state demands on the quality of many types of goods and are used as a tool of the decrease of the production cost of items, the increase of labor productivity, and the increase of the profitability of enterprises. In the circular of the USSR Supreme Council of the National Economy of 30 December 1924, "On Practical Measures on the Boosting of Labor Productivity," which was signed by F.E. Dzerzhinskiy, it was proposed "to take the possible steps on the changeover of a certain portion of industry to mass production with the use on an extensive scale of standardization."

For the accomplishment of vital economic tasks during 1924-1925 the organizational and methods foundations of standardization as one of the tools of technical policy were laid.

A sharp pickup of the work on standardization, especially in machine building, is characteristic of the period of industrialization.

Having gone through the school of the building of large-scale industry, standardization successfully passed the rigorous tests of wartime. The war confirmed the high level of interchangeability of Soviet equipment and its high maintainability.

The economy of the country, which had emerged from a difficult and destructive war, called upon standardization to accomplish the tasks of restoring the national economy.

The period from 1965 to 1970 merits special attention. Against the background of the economic reform of the 1960's standardization began to acquire a modern organizational structure, new functions were given to it. The decree of the USSR Council of Ministers "On the Improvement of Work on Standardization in the Country" (11 January 1965), which anticipates just by a few months the decree of the CPSU Central Committee and the USSR Council of Ministers "On the Improvement of Planning and the Increase of the Economic Stimulation of Industrial Production" (4 October 1965), became a stimulus for the establishment of a network of scientific research institutes, centers of information and propaganda on standardization, and standardization services at enterprises and in sectors. The state certification of product quality was introduced, the State System of Standardization was developed. The content, methods, and forms of work on standardization changed. The standard began to be regarded as a means of product quality control, the acceleration of scientific and technical progress, and the increase of production efficiency.

During the year of the 50th anniversary of October—1967—in an editorial to the December issue of the journal STANDARTY I KACHESTVO it was stated: "The economic reform and the changeover to the new system of planning and economic stimulation are turning standardization into a most important tool of the state management of the domestic economy and the technical level and quality of products."

On 9 November 1970 by the Ukase of the Presidium of the USSR Supreme Soviet the status of a State Committee of the USSR Council of Ministers was given to the Committee of Standards.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On the Increase of the Role of Standards in the Improvement of the Quality of the Output Being Produced," which was adopted on 10 November of the same year, by the great authority of the party and government consolidated the gains, which had been achieved by standardization during the 8th Five-Year Plan, and confirmed its significance for the national economy, and especially for the settlement of questions of quality.

In conformity with this decree assignments on the drafting of standards and the increase of the technical level and quality of the most important types of products and

the level of standardization of items in machine building and instrument making were included for the first time in the State Plan of the Development of the USSR National Economy for the next five-year plan. The USSR State Committee for Standards and its territorial organs received the right to impose economic sanctions for the output of products which do not conform to standards and specifications.

During the 1970's the goal program methods of comprehensive standardization began to make their way in the world. In the sectors of industry the strengthened main and base organizations for standardization launched work on the revision and updating of standard technical documentation. This made it possible to identify and repeal a large number of obsolete standards and to rejuvenate substantially the pool of prevailing ones.

The basic directions of the further development and improvement of standardization were specified by the decrees of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Acceleration of Scientific and Technical Progress in the National Economy" (August 1983) and "On Measures on the Radical Increase of Product Quality" (May 1986), as well as the decrees of the USSR Council of Ministers "On the Organization of Work on Standardization in the USSR" (January 1985) and "On the Improvement of the Procedure of the Drawing Up and Coordination of Technical Specifications in Case of the Development and Delivery to Production of New (Modernized) Products of Machine Building" (January 1986).

The USSR State Committee for Standards jointly with industrial ministries launched work on the development of state standards of general technical demands on groups of similar products. Indicators of quality, which correspond to the world level, began to be established in the standards for a product. Here particular attention is being devoted to the regulation of greater demands on the reliability of items. Standardization in the priority directions of the development of technology is picking up greater and greater speed. The streamlining of the systems of organizational methods and general technical standards is continuing. The Quality-90 comprehensive goal programs, which have been developed in sectors and regions and at associations and enterprises, are being implemented. State acceptance has demonstrated enormous possibilities in the matter of ensuring the stable output by enterprises of only high-quality products.

Nevertheless the radical reform of the management of the economy, which had begun in the country, dictated the necessity of the serious restructuring of standardization. Therefore, the task to analyze the experience of the building of the economy and of the participation of standardization in it, to learn the necessary lessons from this experience, and to take them into account when solving the problems of today and tomorrow is being set for the USSR State Committee for Standards.

Keep Pace With the Times

The 27th CPSU Congress posed as a priority task the acceleration of the socioeconomic development of the country, the resolute change of adverse trends in the economy, and the lending of the proper dynamism to it. The congress demanded freedom to be given to the initiative and creativity of the masses and to truly revolutionary changes of society.

The radical reform of the management of the economy is a key task of restructuring and a most important condition of the acceleration of the socioeconomic development of the country. Here the establishment of a new integral system, which is called upon to have a revolutionizing influence on all aspects of the labor and life of the Soviet people, to give socialism a new quality, and to bring it to a new stage of development, as was stated in the decisions of the June (1987) CPSU Central Committee Plenum, is being placed in the forefront.

The plenum set for central organs of management of the economy of the country the task to ensure, on the one hand, the implementation of the statewide strategy of socioeconomic, scientific, and technical development and the full and reliable balance of the economy and, on the other, the creation of the necessary prerequisites for the efficient management of enterprises and associations under the conditions of their cost accounting independence.

This dictates the necessity, on the one hand, of increasing the centralized influence of standards on product quality and, on the other, of broadening the boundaries of the independence and initiative of enterprises in the matter of increasing it to the world level.

At present it is specified by the Statute on the USSR State Committee for Standards that the committee is an all-union organ of state management, which carries out the supervision of standardization and metrology in the country and to which the determination of the basic directions of the development and improvement of the system of standardization, the intersectorial unification of industrial items, and metrology has been assigned.

In the decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Radical Increase of Product Quality," which specified an entire set of organizational, economic, and legal steps which are aimed at the making of a radical change in the assurance of the output of high-quality products, there were assigned to the USSR State Committee for Standards fundamentally new duties which significantly increase its role and responsibility in the implementation of the unified state policy in matters of product quality, including:

—the coordination of the activity of ministries and departments, which is aimed at the achievement of stable indicators of quality and reliability and a high technical level of the output being produced;

—the active influencing of the technical level and quality of products by the systematic improvement of standards and the bringing of their requirements up to the level of international standards;

—the introduction and the assurance of the great efficiency of the activity of organs of state product acceptance.

The Restructuring of the State System of Standardization

The development of a set, which is interconnected at all levels of management, of standard technical documents (standards and specifications), in which there should be established such demands on products, which would completely meet the needs of the national economy and the Soviet people and would correspond to the world level of quality, under the new conditions is the main task of the USSR State Committee for Standards, ministries and departments, and the councils of ministers of union republics. This set should, on the one hand, erect a barrier to the output of obsolete products of low quality and, on the other, create the conditions and free the hands of associations and enterprises, scientific research institutes and design organizations in the matter of the development of new high quality equipment and consumer goods. Here the assurance of the technical compatibility and interchangeability of products, the limitation of their range, and the determination of the optimum level of unification remain the most important task—and only standardization can fulfill it.

Under present conditions, when product quality is becoming a decisive factor of production, the main procedural principle of standardization—the formulation and implementation of programs of the comprehensive standardization of the most important types of products, which determine the progress of the national economy as a whole—is acquiring even greater importance.

Under the conditions of the state order and the development of direct ties of enterprises (including with foreign partners) comprehensive standardization is becoming the only tool, which ensures the coordination and linking at the state level of the indicators and characteristics of products, their elements, components, raw materials, and materials of the corresponding technical level and quality.

Here it is necessary to nip in the bud the formed tendency toward the reduction of the amounts of this work and, what is the main thing, to declare an uncompromising struggle against the emasculation of programs in the process of implementation and against the elimination from them under the pressure of departmental interests of many assignments, which as a result leads to the abandonment of the principles of goal program planning and to the decrease of the quality of the final product.

The task is during this five-year plan and at the beginning of the next one to encompass by programs and, consequently, by state standards of general technical requirements and general specifications the majority of types of industrial and agricultural output, as well as consumer goods, which both are produced for the meeting of the needs of the national economy and the population and are used for exporting to foreign countries.

Given the restructuring of the planning of the economic and social development of the country, which is presently being implemented, the technical and economic indicators, which are included in the standards and are needed by the state for the implementation of plans and programs of scientific and technical progress and the backing of state orders, should become the base in case of the revision of the norms and standards of the consumption and distribution of products, in case of the planning and in calculations of the material balances, in case of the determination of the needs for materials and components for the production of machines and equipment and the needs of the national economy for this equipment, and in case of the determination of the level of prices.

At the same time for the assurance of the greater flexibility and the more democratic nature of the very system of standardization it is necessary to transfer a portion of the functions of rate setting to enterprises and associations, having granted them the right to formulate, approve, and use kinds of firm standards for their products. The only, but a mandatory demand on these standards consists in the fact that they should establish indicators and demands on a specific product, which are higher and are for a broader products list than in state and republic standards.

As before the improvement of the sets of organizational methods standards remains an urgent problem. Despite the considerable work on their reduction, unification, and simplification, the reserves of optimization here have not yet been exhausted. The USSR State Committee for Standards needs by the end of the five-year plan to bring all the sets of organizational methods and general technical standards in line with the requirements of the economic methods of management.

Despite the steps being taken by the USSR State Committee for Standards, in the sectors of industry and locally the process of the simplification and speeding up of the drawing up of technical and standard technical specifications is proceeding very slowly and with much resistance.

It is necessary to conduct more resolutely the campaign for the sharp reduction of the train of documents and official stamps, which accompany the drawing up of each standard and specifications. The practice, which has justified itself, of the drawing up of the most important state standards by working groups with the enlistment in them of the most skilled specialists of various sectors of both the consumers and the producers of products should be used more extensively.

Use International Standards More Extensively

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Radical Increase of Product Quality" among the measures of influence on the technical level and quality of products posed the task of bringing the requirements of domestic standard technical specifications up to the level of world standards. Therefore, the Soviet Committee for the Participation of the USSR in International Organizations for Standardization and Quality adopted in July of this year the decision: to regard as the most important direction of the activity on standardization in the country the direct application of international standards.

A procedure of the review in the USSR State Committee for Standards of the drafts of international standards, with respect to which the Soviet Union gives a positive opinion, with the simultaneous specification of the forms of implementation of these standards in the USSR was established for speeding up the settlement of this question.

Ministries and departments need to take resolute steps on the increase of the effectiveness of participation in international standardization in the priority directions of activity and to use all opportunities for obtaining materials on advanced foreign know-how from these organizations.

The questions of cooperation on standardization, metrology, and quality control within CEMA are assuming particular importance for the intensification of the international socialist division of labor, which is taking place at the present stage, and the implementation of the comprehensive program of scientific and technical progress of the CEMA member countries.

The USSR State Committee for Standards, ministries, and departments are faced with the task to organize work on the drafting and revision of CEMA standards so that they would be ready by the moment of the conclusion of agreements on the specialization and cooperation of production. The development of the goal program planning of cooperation with allowance made for the priority directions of the acceleration of the scientific and technical progress of the CEMA member countries is necessary.

The Restructuring of the System of the Assurance of the Unity of Measurements in the Country

Under the conditions of the acceleration of scientific and technical progress and the intensification of production the assurance of the unity of measurements in the country is of great importance.

The USSR State Committee for Standards, just as before, should ensure the establishment and leading development of USSR state standards of weights and measurements as the material basis of the state system of the assurance of the unity of measurements.

The main attention should be directed to the radical improvement of the system of the transfer of the dimensions of units of measurements from the state standards of units of physical quantities to all operating means of measurements of enterprises (associations) and organizations through the corresponding standard means, which the territorial organs of the USSR State Committee for Standards and the metrological services of sectors of the national economy have. The task of increasing the accuracy of the checking of measuring equipment and of decreasing the labor-output ratio of checking operations, which should be carried out on the basis of the automation and retooling of the state metrological service and the extensive use of flexible measuring systems, is arising.

The USSR State Committee for Standards jointly with ministries and departments has to accomplish a large set of tasks, which stem from the necessity of eliminating the shortcomings of the metrological support of production, which have been revealed by organs of state acceptance.

The Improvement of Certification and the Introduction of Product Certification

Under the new conditions of management, when wholesale price markups and reductions and, consequently, the profit of the enterprise in many respects depend on the results of the evaluation of the technical level and quality of products, the urgency of the further improvement of the system of the certification of products by categories of quality, the speeding up of the development of the certification system, as well as the utmost development of the system of state product tests, which constitutes their basis, is increasing sharply.

The gained experience testifies to the advisability of the certification of products only for the highest quality category.

The certification procedure should be substantially simplified by the broadening of the rights of state certification commissions, the simplification of the registration of their decisions, and the abolition of the lists of products, which are to be (are not to be) certified. This will make it possible to reduce to one-third to one-half the amount of work on certification.

The establishment in CEMA and the development throughout the world of a system of the evaluation and certification of reciprocally delivered products is objectively having the result that state certification in the USSR is becoming an integral component of the new economic mechanism, which ensures the increase of the competitive ability of products, which are produced by enterprises (associations), on the domestic and world market and the decrease of expenditures by the elimination of duplicate product tests, including abroad.

The objective evaluation of the technical level and quality of a product can be achieved, as is confirmed by world practice, on the condition of the performance of this work by state organs, which do not depend on the developer, the producer, and the consumer. State certification testing centers, which conduct on the basis of economic contracts tests of the products of production associations and enterprises for their conformity to the requirements of state and international standards, can become such organs.

These centers will be established, gradually at first, by the introduction of permanent representations of the USSR State Committee for Standards in the main organizations for state tests of products, then their certification and accreditation as state certification testing centers will be carried out. Such centers can also be established on the basis of scientific research institutes and centers of standardization and metrology of the USSR State Committee for Standards.

A product, which has not received a certificate of conformity to the requirements of state standards, can be produced by enterprises (associations) only on the condition of the transfer by them to the budget of the discount on the established (including contract) price for the product.

The state certification testing centers should also conduct tests of the most important imported products for the determination of their technical level and quality. Here it is necessary to organize the matter so that deliveries of products from abroad would be impossible without positive results of their certification tests.

The Restructuring of the Activity on the State Control of the Quality of the Output Being Produced

In case of the production and use of products under the conditions of the broadening of the independence of enterprises in conformity with the USSR Law "On the State Enterprise (Association)" the increase of the effectiveness of state monitoring of the strict observance of standards and technological discipline assumes particular importance.

The further development of the state acceptance of products and the improvement of state inspection of standards and means of measurements are a guarantee of the fulfillment of this requirement. State acceptance, which is aimed at the radical increase of product quality, was a correct and timely step and, as is noted in the decree of the CPSU Central Committee and the USSR Council of Ministers "On the Results of the Work of Industrial Enterprises Under the Conditions of State Acceptance and the Broadening of the Sphere of Its Activity," state acceptance is now an integral component of the new economic mechanism.

In a short period it demonstrated its effectiveness. State acceptance made it possible to reveal the shortcomings and omissions, which had accumulated in industry, to pose pointedly a number of technical, economic, and social problems, and to change the attitude of workers toward quality.

At associations and enterprises production and technological discipline improved, there were more order and better organization in production, equipment, attachments, and tools were checked and adjusted for technological accuracy, previously "lost" technological operations were restored. Products began to be produced with better consumer indicators and properties. The complaints and expenditures on the pretrade repair of televisions, refrigerators, washing machines, and other durable consumer goods were reduced to one-third to one-half.

The increase of quality with respect to expensive and single-design products is especially appreciable.

Today one-fifth of the volume of output being produced is liable to state acceptance, as of January 1985 it will increase more and will increase further, encompassing newer and newer sectors of the national economy, up to construction. As of next year an overwhelming portion of the products of machine building will be liable to state control.

State acceptance has not yet grown strong and still requires precise organizational steps on the elimination of the existing shortcomings. Its work under the conditions of restructuring also requires further improvement, first of all, in the following directions:

—the significant broadening of the work on the making jointly with the corresponding services of enterprises of a systematic analysis of the state of affairs with quality and on the elaboration of specific preventive measures on the increase of the quality, reliability, and durability of the output being produced and, what is the main thing, the monitoring of the implementation of these measures;

—the tightening up of incoming control and the taking of steps on the assurance of the conformity of the quality of purchased components, semifinished products, materials, and raw materials to the established requirements;

—the provision of product acceptance with automated and built-in means of control, the more efficient use of the system of state tests, and the improvement of the information of consumers about the results of the operation and use of the product.

Moreover, the increase of the influence of state acceptance on the technical level of a new product by the active participation of specialists of state acceptance in the early stages of the devising and development of new equipment, in the drafting of standard technical specifications, in the conducting of periodic, type, certification, and other tests, and in the work of state acceptance and certification commissions will be an important stage of the development of state acceptance.

The USSR State Committee for Standards has taken steps on the further strengthening of the personnel of state acceptance, the increase of their demandingness and adherence to principles, the reduction of paperwork, and the efficient organization of work.

Life indicates the necessity of the systematic changeover to the state acceptance of all the most important products for production engineering purposes, the majority of types of complex household appliances, and the basic materials and components for the indicated products, as well as the extension of the sphere of state acceptance to the products of enterprises of the USSR State Agroindustrial Committee and the construction industry. At the same time as the development of state acceptance the work of state inspection organs should be substantially reorganized.

The committee has taken steps on the broadening of the scale of this work in order to encompass by state inspection the products of all enterprises, at which state acceptance has not been introduced, and to tighten up control at the stage of the development and use of the product. The task is to ensure the interaction of organs of state inspection of standards and means of measurements with organs of state product acceptance and to establish the unified organizational methods supervision of their activity on the territory of the corresponding region.

The experience of the joint work of republic administrations and centers of standardization and metrology of the USSR State Committee for Standards and organs of state acceptance confirms the necessity of strengthening such interaction. It is becoming a matter of concentrating state control of product quality in the country mainly in the USSR State Committee for Standards and of eliminating the majority of organs of interdepartmental control. This will ensure the efficient distribution of forces in the work on curbing the delivery to consumers of poor quality products.

Only a portion of the tasks, which have to be accomplished today and tomorrow, have been examined here. Life is changing rapidly and restructuring is gaining speed, requiring new decisions of us every day and illuminating dark spots and neglected sections. Active participation in restructuring is our primary task, and the contribution of standardization to the success of the strategy of acceleration depends on this. While its accomplishment, as was noted in the decree of the June (1987) CPSU Central Committee Plenum, is a most important partywide, national matter, an integral part of the process of the modernization of the entire life of the country, and a direct continuation of the cause of October.

Footnote

1. V.I. Lenin, "Poln. sobr. soch." [Complete Works], Vol 36, p 300.

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Changes in State System of Standardization Under New Conditions

18140194b Moscow STANDARTY I KACHESTVO in Russian No 11, Nov 87 pp 10-21

[Article: "What Should the Standard of the Future Be Like?" first 24 paragraphs are STANDARTY I KACHESTVO introduction; last 6 paragraphs are STANDARTY I KACHESTVO conclusion]

[Text] From the editorial board. In the anniversary issue of the journal we wanted to publish a problem article on the theme: what should the standard of the future be like, that is, what changes should occur in the state system of standardization under the new conditions of management.

But from whom is such an article to be ordered? Theorists, experienced workers, workers of the system of the USSR State Committee for Standards, or sectorial scientific research institutes? And at that time the decision was made to hold a round-table meeting, at which representatives of industry, agriculture, science, and organizations for standardization could voice their opinion.

Such a meeting was held on 3 September 1987. There took part in it:

—Doctor of Technical Science A.Ye. Prokopovich, an advisor of the State Committee for Science and Technology;

—Candidate of Technical Sciences V.F. Romanov, general director of the VNIIinstrument Scientific Production Association;

—A.I. Panov, general director of an association;

—Candidate of Economic Sciences Ye.V. Sapilov, head of a sector of the Institute of Economics of the USSR Academy of Sciences;

—A.S. Melik-Sarkisyants, leading designer of the Moscow Machinery Plant;

—Candidate of Technical Sciences A.M. Kruglyakov, head of a department of the All-Union Scientific Research Institute of Agricultural Machine Building;

—I.S. Begunov, deputy chief of a subdepartment of the USSR State Agroindustrial Committee;

—V.I. Shirokov, V.A. Denezhkina, and A.A. Kudoyarov, representatives of main organizations for standardization;

—Candidate of Technical Sciences E.V. Veytsman;

—Candidate of Philosophical Sciences B.A. Urvantsev, an associate of the VNIIMSO.

Representatives of the USSR State Committee for Standards and the All-Union Scientific Research Institute of Standardization attended.

V.V. Tkachenko, editor in chief of the journal, conducted the round-table meeting.

The participants in the round-table meeting were invited to express their opinion on a problem which is attracting more and more attention. What should the standard of the future be like under the conditions of the radical restructuring of the management of the economy?

These questions arose at the moment, when the system of standardization in our country, it would seem, had acquired a certain stability. Decree No 13 of the USSR Council of Ministers "On the Organization of Work on Standardization in the USSR" established the objects of state standardization, the categories of standards, the level of approval of documents, and so forth. This decree officially legitimized such concepts in the area of standardization as the group of similar products, standards with long-range requirements, and a number of others.

Decree No 65 of the USSR Council of Ministers "On the Improvement of the Procedure of the Drafting and Coordination of Technical Specifications in Case of the Development and Delivery to Production of a New (Modernized) Product of Machine Building," which was aimed at the simplification of the procedure of drafting documents and removed a number of unnecessary restrictions from the activity of designers, had a substantial influence on the streamlining of the work on standardization.

Decree No 540 of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Radical Increase of Product Quality," in which the place of standardization in the management of scientific and technical progress and product quality was specified, became a most significant milestone.

A number of decrees of the USSR State Committee for Standards on the streamlining and optimization of the systems of standards were adopted to execute these and other directive documents. In 1986 a new version of the set of standards of the State System of Standardization was approved. Thus a number of important measures on the improvement of the work in the area of standardization were implemented.

However, the June (1987) CPSU Central Committee Plenum, which adopted a program of the radical reform of the management of the economy and specified a major change of the entire system of management of the national economy, makes it incumbent to look from a new standpoint at the problems of standardization.

The process of the modernization of the mechanism of the management of the economy is under way, assuming more and more specific forms. The serious question of the correspondence of the centralized management of the national economy and the increasing independence of its units is arising. The dialectics of the present period, which should find reflection in the further improvement of all the work on standardization, lies in this.

Questions of the improvement of sectorial, territorial, and firm standards are arising in connection with the change of the status of ministries, the necessity of the harmonization of the interests of sectors and regions, and the broadening of the rights and independence of enterprises.

This approximate set of problems was posed for discussion by the round table.

A.I. Panov

In order to imagine standardization of the future, it is necessary, so it seems to me, to investigate thoroughly its past and present. Here, apparently, one should proceed from the generally accepted definition which has been acknowledged by the International Organization for Standardization: standardization is the establishment and use of rules for the purpose of streamlining the activity in a specific area on behalf of and with the participation of all interested parties.

I am convinced that standardization, which literally corresponds to this definition, always was and always will be, since the aspiration to streamline one's activity, establishing for this specific rules, the fulfillment of which, at the least, is useful, is fundamentally characteristic of man. By means of such standardization man has always selected and assigned for preferential use everything that is best and useful, has been checked by practice, and, therefore, is reliable and guarantees success, that is, the achievement of a specific goal with the

least expenditures of time, efforts, and assets. And if we cite examples, then, for example, the system of Stanislavskiy is nothing other than a result of the standardization which is being spoken about. For Stanislavskiy, in developing this famous system, generalized many years of experience of acting skill and formulated its basic principles and rules. Therefore, young actors, having mastered this system, in a short time attain the level of the masters of the past.

At one time the development of the cooperation of labor dictated the necessity of the establishment of norms and rules, without the application of which it was impossible to produce a whole out of its individually produced parts. Such, if it can be expressed this way, technical standardization, of which unification is the basis, and everything, which is connected with the assurance of the interchangeability of parts within a unified whole, also were, are, and will be, being developed together with the development of industrial production with its specialization and cooperation.

You would not say this about the standardization, which emerged and developed very rapidly in our times, in our country, and in a number of other socialist countries. The point is that with the development of the planned economy of socialism in the direction of the strengthening of not economic, but administrative command management standardization began to be used not so much for the regulation of the norms and rules, which make it possible to develop and series produce high-quality products, as for the regulation of specific demands on the technical level and consumer properties of specific items. As a result standardization developed into one of the important elements of the centralized administrative command management of product quality, since the standards, that is, the requirements contained in them, actually became the basis of the planning and economic stimulation of the increase of the quality of domestic products.

I am sure that the implementation of the reform of the management of the economy is incompatible with such standardization. After all, if we turn to the definition of the concept "product quality," which has also been legitimized by the corresponding standard, it will become clear that the quality of a product can be planned (that is, specified, ordered), evaluated, and paid for only by its client and the consumer, who knows better than everyone what he needs and to what extent what has been made to his order satisfies him. Therefore, as the dictation of the producer is replaced by the dictation of the consumer, the centralized administrative command standardization of product quality should be replaced by contractual relations of consumers (clients) and producers of products. If they decide here that it is necessary to draw up the results of their understanding with respect to what properties the ordered item should have in the form of the corresponding standard, this is their business. Here it is clear that if the client is the state, the standard can be a state standard, if it is the sector, it can be a sectorial standard, if it is a plant or association, it can be a standard of the enterprise.

As to the suggestions on the introduction of firm standards, they, so it seems to me, have the right to existence, but only as an advertising and warranty document. Its task is to show the potential clients and consumers what the firm (enterprise) can do and what it is willing to do for some fee. This is the first thing. But, second, the existence of such a firm standard signifies that if the client or consumer does not find the properties of the items, which are recommended by it, the firm will have to pay for this, accordingly decreasing the price or paying the necessary compensation.

Everything said makes it possible to draw the conclusion that many functions of the USSR State Committee for Standards, its institutes, organizations, and territorial organs should be changed substantially. It is difficult now to say precisely which ones and how. It is easier to list in the activity of the USSR State Committee for Standards what, so it seems to me, should remain without changes or should even be strengthened. This is first of all the standardization of the norms and rules, which are necessary for the efficient functioning of modern social production and its development and improvement. Moreover, standardization in the area of labor safety techniques and environmental protection should undergo substantial development.

As to the functions and tasks, which are connected with the assurance of the increase of the technical level and quality of a product, the role of the USSR State Committee for Standards, apparently, should remain without changes only as applied to a product, which is developed and produced in accordance with state orders. As to the assurance of the proper quality of all other products, the State Committee for Standards and its organs can and, so it seems to me, should perform the functions of an arbitrator between the clients and producers of items, as well as a source of objective information on the achieved level of quality of domestic and foreign products. Therefore, it is necessary to ensure the significant increase of the role of the USSR State Committee for Standards as the state organ, which is responsible not only for the metrological support of production, but also for the utmost development of systems of state tests of products and their attestation and certification.

V.F. Romanov

The development of the system of standardization and, consequently, standards is directly dependent on the existing trends of change of the management of the national economy.

What in the immediate future will happen with the sectors of industry?

The sector of today is, in reality, a large motor vehicle firm, machine tool building firm, and so forth. Now these "firms" are being broken down into smaller specialized, independent ones, which are called production associations. Great independence will be given to them, they will actually be self-managed.

Interbranch complexes, which will also be developed all the time and will include enterprises and organizations of the same type, are also being established.

If we base ourselves on this, the following changes in the system of standardization, in my opinion, should occur. Mounting dimensions (interchangeability), safety requirements, and environmental protection will remain an object of state standardization.

Sectorial standards, following the logic of the restructuring of sectors, will become standards of the firm (enterprise, association). The indicators of the product quality of this firm (the guarantee of quality) should be established in them.

Each firm will suggest its own quality parameters. How should they be matched up? It seems to me that the methods of evaluating the quality and the means of tests should be standardized for similar types of products, that is, an independent group of standards, for example, with respect to the methods of evaluating influencing factors should be formulated. Consequently, a new type of state standard will appear. The characteristics of quality and the methods of evaluating this quality, which are incorporated in the standards, should be introduced without fail in the corresponding standards of the firm (enterprise).

Who will formulate these standards?

The corresponding organization with centralized financing will formulate statewide standards—in accordance with the order of the USSR State Committee for Standards, that is, this work will be performed as a state order.

The corresponding enterprises or associations will formulate firm standards, but while submitting them without fail to the consumer of this product. They will be the basis of the pricing of the product.

The formulation of standards for methods of evaluating quality and for the testing of products should be assigned to state testing centers (GITs's). Under the new conditions their role will increase, especially if one considers that the system of product certification will be in operation without fail.

I believe that with the change of the management of the economic mechanism the role of the USSR State Committee for Standards should not decrease, but increase. Abroad the market determines the demands on product quality. I believe that in our country, at least soon, there will not be such competition, which will be able to dictate the demands on quality. It will be necessary to control quality, to keep an eye on it, to check it. The USSR State Committee for Standards should do this. Since regional independence is being developed, its territorial organs should perform the basic control functions, but under the general procedural supervision of the committee. In this way the role of the territorial organs of the USSR State Committee for Standards in all matters of standardization—from their approval to checking locally—should be increased.

The system of the development and delivery of a product to production should also undergo significant changes in the direction of the simplification of the entire procedure and the giving of greater responsibility and independence to the enterprises, which produce the product, a number of standards should be transferred to the category of recommended, and not mandatory standards, the conditions of the delivery to production of a custom-made and mass-produced product should be different.

Ye.V. Sapilov

The increase of the role of state norms in the management of the economy will have, in our opinion, a substantial influence on the development of state standardization and will bring about a change of its orientation and functions. Of course, here the traditional organizational and technical direction of standardization, which has justified itself in practice, will undergo further development. However, I would like to speak about the future.

The interdependence of technology and economics is responsible for the trend toward the strengthening of the contact of state standardization with the state system of production, economic, and social norms and standards. State standards, which specify the technical and economic demands on a product, are becoming more and more a component of the system of state norms. Hence the change of their content: from regulations for individual technical parameters of a product they are developing into regulations of its technical and economic indicators, which are directly linked with the state system of norms and standards, in other words, which "appear" in the system.

State standards, thus, should act as norms of the national economic demands on product quality. Moreover, these demands should be based on the socially necessary need and should express this need in specific technical, economic, and social indicators. At present, as is known, standards and specifications express only the lowest level of the demands on a product, which is determined not by the need, but by the potential of the sector of the producer. The domination of the dictation of the producer over consumers exists here. An end should be put to this dictation.

The demands on the level of quality of an industrial product are clearly specified by directives of the party and government—it should correspond to the best world achievements with respect to technical perfection, the level of satisfaction of needs, and economic efficiency in the national economy. But the governing principle is such that it is possible to produce the best product in the world only in accordance with the best technology in the world, otherwise it will not be economically efficient, although with respect to a set of individual technical indicators it may also conform to the world level.

Consequently, state standards of a world level for the technical and economic indicators of production are necessary, since it does make a difference to society by what method and how efficiently as compared with the best achievements the output of a product is accomplished. In state standards it is advisable to establish indicators of the consumption of basic and scarce raw materials, materials, fuel, and labor, as well as the capital investments per unit of produced output. These indicators specify the amount of expenditures and make it possible to estimate the real economic efficiency of domestic production.

Thus, in the system of state standardization in the future two directions should undergo development: the standardization of national economic demands on product quality and the standardization of the indicators of the technical and economic level of production. Preparation for the development of these directions should be started in the immediate future.

B.A. Urvantsev

The first thing that I want to say is that standards should reflect the requirements of the consumer. If this is taken as a basis, many present principles of the rigid system of standardization will disappear.

Why, for example, are enterprises prohibited from producing a nonstandard product? Apparently, to protect the consumer. But the consumer should have the opportunity either not to purchase this product at all or to pay for it significantly less than for a standard product. Then the producer will be punished, and, moreover, without the participation of state inspection.

Why are people now berating standards? Because the producer formulates them. In my opinion, it is necessary to turn the formulation of standards for a product over to the consumer. In this case the basic norms, which determine the consumer properties of a product, will be recorded in the standards. There will be few such norms: 2-3, 8-10—as many as the consumer needs. As a result the formulation of standards will be simplified and will be sped up. They will cease to be thick volumes that need additional interpretation.

Leading standards, which for some time no enterprise can fulfill, should also exist without fail. I am for such standards, because through them the consumer will make on the producer demands that are based on the latest achievements of science and technology.

If the enterprise can produce a product in accordance with this standard, let it produce it and receive a substantial price markup. It seems that under the new conditions of management enterprises will calculate what it is profitable for them to produce, and what it is not profitable for them to produce.

There is another question: Who will approve all these standards? Perhaps the clients themselves and consumers?

V.F. Romanov

Our system of standardization is one of the important units of quality control. Since you are speaking only about the understanding of the consumer with the producer, do you think that the state system of quality control should be retained or eliminated?

V.V. Tkachenko

And what about the state order?

B.A. Urvantsev

You are right, there should be state standards, complete control over which must not be given to either the consumer or the producer. This concerns the standards, which support interchangeability, labor safety techniques, labor safety regulations, nature conservation, and so forth. But all temporary questions, which depend on market conditions and geographic, national, and other conditions, should be settled within sectors, associations, and enterprises. It is necessary to give them freedom. If freedom does not exist, no restructuring will occur in standardization. If we leave in force all the principles, which are incorporated in All-Union State Standard 1-85, we will not restructure anything.

And a last thing. In the plan of our round table there are purely practical questions, but one must also not evade theoretical questions. We do not have a scientifically developed theory of standardization. We do not have clear criteria of what the object of standardization is. Alternative solutions, suggestions, disputes, and so on also start from this. All this must be resolved scientifically.

A.Ye. Prokopovich

The concept "the goal of standardization is the support of the continuously developing demands of the consumer," which has been heard here, for the most part does not raise doubt. But is the consumer always objective?

The concept "consumer" is very relative. Thus, producers, which are machine builders, at the same time are consumers. In what is the consumer interested? On the basis of the information he has, in obtaining a product that is a little better and a little cheaper, while the producer is interested in selling an assimilated product at a little higher price and in deriving the maximum profit. Therefore, it is not always correct to insert in the law only what the consumer wants without regard for the general laws of the development of technology.

If we based standardization only on the fact that the producer submits the specifications for approval to the consumer, we will come to a halt in our development. For given the prevailing system of the production of equipment the consumer has nowhere to go, he needs metal or a machine tool and he is forced to shut his eyes to something.

Under these conditions the role of state standardization is increasing immeasurably. The USSR State Committee for Standards should become the arbitrator between the consumer and the producer and rigorously guard state interests, on the basis of the laws of technical progress and the use of the scientific potential, which, apparently, it will become more and more difficult to protect. Whereas previously the USSR State Committee for Standards dealt only with 30 ministries, now every firm and every enterprise will try to see to it that the demands of the consumer would not prevent him from earning the assets that are necessary for production activity and social needs.

The state standard for the final product should include the most important operating parameters, should bring them in line with the international level, and should surpass it, ensuring a leading role of the Soviet Union and CEMA. The regulation of individual design decisions should be resolutely rejected.

It seems to me that for the acceleration of scientific and technical progress and the increase of product quality it is necessary to increase sharply the role of long-range standards. Moreover, it is advisable to differentiate standards into long-range and prevailing standards according to the degree of obligatoriness. The prevailing standard should contain all the requirements and indicators, first of all qualitative ones, which the producer guarantees in the product being produced, while the long-range standard should contain the new elements of technology and design, which should be incorporated in the new product. Long-range standards should initially be of a recommendatory nature and should become mandatory, when the item is produced and appears on the market. New equipment, as is known, is not developed in a single day, and time is needed for the changeover to the long-range standard. The consumer will not receive the machines which exist, and here a standard-law, which is mandatory for the producer and the consumer, is needed.

On the question of the objects of standardization I would also like to say the following: among the requirements, which are liable to mandatory state standardization, the questions of unification were not taken into account here, but they are very important for machine builders. The introduction of the demands of unification should be carried out in the same way as the demands on a product in two stages: the recommendatory standard—until the centralized production of unified items has been organized, so that the designers could take it into account during development, and the mandatory standard—after the organization of centralized production. Such a procedure will help to speed up the settlement of questions of the intersectorial unification and normalization of gears, shafts, and other elements and at the same time will afford the possibility of some flexibility.

Programming languages and computer software are also liable to state standardization. Mathematical language should be an all-union language. Now this work, unfortunately, is being performed in a primitive manner.

With regard to the role and place of sectorial standardization. I believe that sectorial standardization has specific functions which can and should be retained. The demands on the product, which the sector produces, can be regulated in the sectorial standard. The ranges of products being produced and the technological regulations for the basic processes of the production of the most important types of products for all enterprises of the sector, which guarantee the obtaining of the desired quality, are liable to sectorial standardization. The labor and material norms for the product of the sector, which is specific to it, should also be reflected in sectorial standards.

Firm standards, or standards of the enterprise, as they are now called, should perform two different functions: one function is the function of restrictive standard specifications (which by some coincidence "disappeared" from the State System of Standardization), the second is the establishment for the product being produced of higher qualitative indicators than in state standards.

In machine tool building, for example, so-called delivery norms exist. They are 30-40 percent more exacting as compared with the state standard. This is not an advertisement, the enterprise actually produces and delivers the product with these indicators.

With regard to tests and diagnosis. It seems to me that at the first stage (during the next few years) enterprises should design and produce diagnostic equipment, while the methods of tests and the detectors should be identical for the producer and the consumer. The USSR State Committee for Standards should ensure this.

At enterprises it is advisable to carry out the standardization of more differentiated technical and economic indicators than in sectors, with allowance made for the

specific nature of the enterprise. It is natural that the sector and the enterprise have the right to formulate and introduce state standards for items or parameters of intersectorial significance.

Republic (regional) standards should encompass what we call national consumption. This can be national clothing, furniture, and so on, as well as regional climatic requirements. In the all-union list of standards, so that there would not be duplication, it is necessary to stipulate clearly what pertains to regions, and what pertains to administrative subdivisions.

Now about the procedure of the planning and financing of the formulation of standards. Everything that pertains to the sector and state standardization is a state order. Both the consumer and the producer can be the formulator of a standard, but one condition should be observed: the standard should be agreed upon between the consumer and the producer. The consumer should know what he is buying today and what is being developed for the future. The system, so it seems to me, is quite simple.

Concerning the coordination of standards. It seems to me that three people: the formulator, the consumer, and the USSR State Committee for Standards, should settle the question of one standard or another. Moreover, the USSR State Committee for Standards should do so as an arbitrator in case of disagreements. It is not mandatory to come to an agreement with all other departments and instances, which do not bear direct responsibility either for the quality or for the operating properties (the All-Union Central Council of Trade Unions, the Ministry of Foreign Trade, the State Planning Committee, and others). It is natural that the formulator of a standard bears the full responsibility for the observance of prevailing laws and standard documents (labor safety techniques, ecological problems, and others).

A.M. Kruglyakov

The restructuring of the economic mechanism envisages the changeover from directive, administrative management to economic management. But our standards are nothing other than directives, which indicate by how much labor productivity is to be increased, by how much the metal content of a machine is to be decreased, and so forth. The present system of standardization is a spokesman of the will of the administration.

Under the new conditions of management the system of standardization should be changed radically. I do not want to say that its role would be decreased. No. In case of the changeover of enterprises to independence it should even increase, but its framework should be narrowed. It is impossible to standardize everything.

Therefore, I cannot agree with the suggestion of Ye.V. Sapilov on the introduction of a standard for technical and economic indicators. What will the designer and process engineer then be permitted to do under the conditions of the effect of the principle: "it is permitted to do everything that is not prohibited by the law"? The more freedom we grant to the producer of a product, the more rapidly we will advance in the acceleration of scientific and technical progress. Of course, within reasonable limits. One must not, for example, permit the full freedom of the producer (even in the interests of the consumer) in case of the development of standard structural elements or safety requirements.

I share the point of view of B.A. Urvantsev concerning excessively rigid standardization. During the past decade we have gotten too carried away by standards.

But how many reproaches production workers are voicing due to excessive regulation! This is especially perceptible now under the conditions of state acceptance. For due to the formal approach to the requirements of numerous sets of organizational procedural standards at times they halt production. Tens of people are diverted for the elimination of identified shortcomings. And we spend tens of hours pointlessly and in vain just for the sake of paperwork. In practice without improving anything.

An important feature of the restructuring of the system of standardization is the priority of the consumer.

Here for some reason the opinion was expressed that the consumer will take everything that is offered him, since we do not have competition. But there is a domestic and a foreign consumer. Plants will trade on the foreign market. They will come to this inevitably. They will want to purchase for currency a foreign instrument, machine tool, and so forth and will be forced to earn currency. Here the producer will also have to think about quality.

And still the system of standardization should not be based only on the interests of the producer. This does not yield the desired results.

For the rectification of the existing situation it is necessary to restructure not only the system of standardization, but also the work of the USSR State Committee for Standards. Now it is defending the interests of the producer. For example, an institute of the corresponding sector of industry formulates the standard for rolling bearings, then it passes through the corresponding administration of the USSR State Committee for Standards. The interests of the consumer are left aside.

In conclusion I would like to support the opinion of A.Ye. Prokopovich about the need to have tentative recommendatory standards. Perhaps even to confer on them the letter "R." Production should see the future.

A.S. Melik-Sarkisyants

I represent the unit, in which all developments in the area of standards are implemented and all the errors of standardization and its excesses are perceived especially keenly. Having worked 32 years at a plant, including 17 years as the main designer, I received a large number of penalties for deviations from state standards. Moreover, formal and forced ones. I am well aware that the norms for the composition of the exhaust or the transportation properties of a motor vehicle should be observed. This is difficult, but this is necessary.

Often secondary requirements are regulated in standards. At times it is simply impossible to fulfill them.

The system of certification brought us great trouble. With its introduction product quality did not become better, while the paperwork increased. Much time was spent, for example, on the filling out of the card of the technical level and on the search for the best analog.

In individual cases the requirements of standards come into direct conflicts with the present interests of the consumer. I want to cite a graphic example. In the north they are forced to heat our dump trucks (the cabs and batteries). On this they spend about 700 rubles, while the vehicle is idle 1-2 months. We decided to do a good deed: we heated the cab and the battery. But the representative of state acceptance found that we had not met two requirements of the standard: we had painted the cab the wrong color and had filled the vehicle not with "northern" oil (although this was in the summer). On this basis acceptance was halted. The consumer from the north sat 2 weeks at the plant, until he persuaded them through the USSR State Committee for Standards to give him the vehicle.

I agree with those who have suggested to place at the head of all the demands on quality the real requirements of the consumer. It is necessary, in my opinion, to control quality mainly through the specifications for a specific product and, as they said here, "the firm standard." The real conditions of today and the real possibilities of production can be taken into account in specifications, which the standard cannot do.

It is not necessary to standardize all little things. Because of this the authority of the standard decreases drastically. Whereas 20 years ago I knew all the standards, which directly concerned me, now I do not know half of the state standards.

I.S. Begunov

It is difficult to add anything to what has already been said. I agree with many statements.

In my opinion it is obvious that state standards should guard the consumer. It is impossible without this. Until there are other levers and an economic mechanism, which will manage, stimulate, and guarantee, has begun to operate, we will not be able to ensure quality without state standards. Therefore, I believe that the role of state standards in matters of product quality should be increased.

And another thing. It is necessary to increase the prestige of state standards. I do not know how it is in other sectors, but in agricultural machine building state standards have been formulated even for orchard and garden implements: watering cans, rakes, and shovels. In my opinion, for the authority of state standards it would be better if the scale of standardization were narrowed somewhat. It is necessary to enlarge the range of items (this, first of all, pertains to consumer goods), which it is possible to produce not according to the standards, but according to other standard technical specifications (sectorial, territorial). Perhaps, there even are types of items, which can be produced according to the standards of the enterprise.

State standardization should be focused on the main, decisive directions of scientific and technical progress, which each sector specifies.

E.V. Veytsman

If we are speaking about what the standard should be like, first of all it should be stable over a long interval of time. For example, here people spoke about the need to standardize machine language. The USSR State Committee for Standards is already performing work on the standardization of some information. I have in mind classifiers.

The first edition of these documents was issued 10 years ago. Sectorial documents began to be drawn up on its basis. A short time passed and they were completely revised. I do not know to what extent they became better, but our sectorial system, which is based on the old edition of the classifiers, actually turned out to be ineffective.

Perhaps, it is better not to hurry with the issuing of poor-quality documents.

V.I. Shirokov

I will begin with which standards are needed and which are not.

Take foreign experience. State standards, firm standards, and standards of various associations exist there. But he, whose interests it protects, formulates these standards. Thus, it should also be in our country. If it is the interests of the state, the standard should be a state standard. And one must not build a rigid framework, as if there are only ecology, safety, and so forth. For example, it is necessary to put out a fire, it is necessary that the crew would drive up and quickly screw the hose to the hydrant, hence, it is necessary to standardize the connecting elements and so forth.

If a standard is needed, it will be observed, even if it is recommendatory. For example, in the United States there is a corporation which deals with the delivery of radio sets for civilian airlines. A working committee made up of eight people, which deals with standardization, is attached to it. They issue only recommendatory documents. But these documents ensure complete interchangeability. What does this yield? If, for example, a Boeing has flown from England to Australia, and some electronic equipment of it has broken down, he simply finds according to the number of the standard the needed equipment, without being interested at all from what firm and what country it is, and installs it in the plane. In 3 minutes the Boeing is ready to fly. Identical electronic equipment exists at all airports. The airlines, which dictate their requirements, are interested in this. And if they are not fulfilled, no one will buy equipment from the producer firms.

Are sectorial standards needed? Yes. But the interests of the sector should be reflected in them. Now these interests will change, hence, the standards will also change, but one must not dictate how. The sector will decide this. If the sector decides in 3-5 years to change the standard, let it.

I believe that it is also necessary to give firms greater freedom. Abroad the standards of the enterprise are used not only at enterprises.

In conclusion the leader thanked the meeting participants for their activity and noted that all the participants had expressed the unanimous opinion about the necessity of restructuring the system of standardization under the new conditions of management and of increasing the role and prestige of state standards, the necessity of concentrating their influence on the meeting of the most important needs of the national economy and the population, on the establishment of standards of quality and the saving of raw materials, materials, fuel, and energy and of requirements, which are directly connected with the life and health of man, as well as on the assurance of the interchangeability and technical compatibility of items.

The necessity of the increase of the role of the consumer in the formulation and approval of standards and his priority in the choice of norms and demands on product quality was emphasized.

The advisability, in connection with the broadening of the rights of enterprises, of the establishment of the concept "firm standard" as a standard document, which goes beyond the enterprise, was noted in the majority of statements. The opinion on the necessity of the increase of the significance of the indicators of standards and the decrease of their number was also common.

The suggestions of the meeting participants will be considered during the preparation of changes of the State System of Standardization in conformity with the Basic Provisions of the Radical Restructuring of the Management of the Economy.

The discussion of the questions, which was begun at the round-table meeting, will be continued both at subsequent meetings and on the pages of the journal.

The editorial board asks readers to send in their suggestions on the restructuring of the system of standardization and on the composition and content of standard technical specifications under the new conditions of management.

7807

Enterprises to Pay for Specialists

18140239e Moscow NTR: PROBLEMY I RESHENIYA in Russian No 6, 22 Mar-4 Apr 88 pp 6-7

[Interview with A. Porshnev by S. Abramov: "Specialist on Contract"]

[Text] **A. Porshnev, rector of the Moscow Institute for Management imeni S. Ordzhonikidze, explains, "New relations with industry have been established for our VUZes. In order to obtain the needed number of graduate specialists the sectoral ministries to which the client enterprise is subordinate sign a contract with the USSR State Committee on Public Education. Only then will the enterprise pay, from its fund for the development of science and technology, 3,000 rubles for each engineer or economist. Then they will come to its shop, department or laboratory.**

The full cost of training a specialist is, of course, much more, depending upon the VUZ and ranges from 6,000 to 15,000 rubles. In addition, the cost of higher education is steadily increasing. There are increases in the size of stipends for students, salaries for teachers and the cost of laboratory equipment and computers. This process is under way in other countries. However, in ours there is a considerable gap between the current cost of education in higher schools and the funds budgeted to them. Additional receipts from sectors can help in partially solving this problem. This will improve the quality of specialist training, the purpose of the perestroyka of higher schools.

[Question] Anatoliy Georgiyevich, how are innovations influencing the prestige of engineering labor?

[Answer] Only positively. The pay for graduate engineers should radically change the attitude of production workers towards them. Up until now it has been easier for an enterprise to get an engineer than to find a worker. Every year enterprises allocate sizable sums for training highly

skilled workers and creating the appropriate living conditions for them. In contrast, they obtain almost as graduate specialists as they request. Moreover, they do not have to spend a single kopeck for them. Administrations do not show enough concern for the daily lives of young specialists—for three years they do not have the right to leave the enterprise. However, even if they leave after this time, the vacancy can be easily filled. As a result, engineers are reduced in value. It is no accident that about one million graduate specialists have "reclassified themselves" as workers.

I understand. There are even attempts to justify this process, considering it as natural. It is said that contemporary equipment, crammed with electronics, can be operated only by people with higher educations.

Nobody is disputing that it is hard to operate modern equipment if one is not highly skilled. However, the system for vocational education is engaged in training such people, it does not have to be replaced.

The amount higher schools pay for graduate specialists should lead to their more rational use in production and to better based requests for them. The conversion of many enterprises and associations to the new working conditions has already made this noticeable.

The decisions made at the February (1988) CPSU Central Committee Plenum is promoting closer contacts between VUZes and industry. In accordance with them, together with the distribution plan—a unique form of state order for specialists—educational institutions will assign some graduates through direct contracts with enterprises.

Payment for such specialists also qualitatively changes the principle of enterprises delegating workers and employees to institutes and universities. Now, to the 3,000 rubles paid as stipends to their students, an equal amount is added to "ransom" them from higher schools. Managers of plants and factories, especially under conditions of cost accounting, must first think about whom to send to study and what they should study.

[Question] There are enterprises which do not pay anything for training specialists, for example, those losing money. How will it be for them?

[Answer] I think that a ministry should help its subordinates which are in a difficult financial situation. In the final account cadre renewal, the arrival of new forces, is also a measure in the struggle against money loosing and unprofitable production. For the most part, of course, an enterprise should contribute its own money to a VUZ to obtain specialists. More accurately, this money should go to the account of the State Committee for Public Education. In my view, a situation where a VUZ does not really see money for professional activities is not in accordance with cost accounting principles.

I would also like to note the prospects for converting to cost accounting the post-VUZ [nadvuzovskiy] system of training and improving cadre's qualifications. We are also thinking about gradually converting to such relations with industry. Our institute will train and re-educate about 1,000 people annually at the faculty for the organizers of industrial production and construction. Also, many Muscovites with higher educations obtain a second speciality without stopping work by attending special evening faculties. Therefore, converting the retraining system to cost accounting will give us additional resources to improve educational and research work and to provide incentives for teachers. This will force enterprise managers to more carefully select students and to give preference to specialists whose training will be of additional use to production.

Thus, our institute has set itself the task of teaching the management apparatus of all enterprises in Volgogradskiy Rayon how to work under the new economic management conditions. While today our rayon consulting centers help, for example, the "Frezer" Plant, the Stankoagregat and others free of charge, today it makes sense to think about a new type of account.

11574

Changes in Science Policy

18140239c Moscow NTR: PROBLEMY I RESHENIYA in Russian No 6 22 Mar-4 Apr 88 p 3

[Interview with G. Marchuk, Academician, by A. Lepikhov: "Fundamentals of Renewal"]

[Text][**Question] Guriy Ivanovich! Your report, speeches by the vice-president of the USSR Academy of Sciences and communiques by the chief scientific secretary have mentioned achievements by our scientists, of which we are justly proud. Nevertheless, to me your report seemed sharply critical...**

[Answer] Yes, this is our general position. In fact you can read it in the decisions by the CPSU Central Committee February Plenum and in M. S. Gorbachev's speech there. It was again pointed out that the present stage of perestroyka requires new methods and forms of training and the continuous retraining of all workers.

The level of education in our country is to a great extent determined by the level and state of basic research in the natural and social sciences. Through textbooks, science and popular science books and the mass media basic science has a very strong influence upon education. The latter, in its turn, is a conductor of scientific and scientific-technical ideas, a powerful means for their practical realization and for the formation of the individual as a person and as a specialist. Science and education should be very closely connected.

Unfortunately, the dogmatism of the 1960's and the struggle against so-called multiple job holding by scientists divided VUZ and academy science. To a considerable extent the academy lost the possibility of selecting capable young people and actively influencing its own cadre replacement. There was a sharp reduction in the flow of graduate students to academy institutes. Not only were scientific ties between VUZes and academy institutes broken, there was also a decline in the scientific quality of VUZ departments and laboratories.

To make this problem less acute we suggest that VUZes give top priority to accepting scientists from the USSR Academy of Sciences to jointly hold jobs without any restrictions. We also think that academy institutes should hire teachers from higher education to do scientific work.

The costs of organizing such bilateral "ties" would not be high, but would permit, within 5-10 years, the restoration of the unity between academy and VUZ science.

Another measure to combine science and education would be the extensive engagement of academy collectives as bases for leading departments in the most important areas of basic science at universities and some VUZes. In my view this must be done without delay.

[Question] Two years ago, in 1986, at a meeting of social science departments at VUZes and one year ago at a meeting of social scientists it was deemed necessary to extensively activate research in this area. What has been done?

[Answer] Not nearly enough, only the first steps. Today our historians, philosophers and literary specialists are swiftly increasing the pace of their work. Take, for example, problems of history and current affairs. By removing all taboos and eliminating "blank spots" glasnost has caused a gigantic increase in interest in history, first of all, of our domestic affairs and the seven decades in the construction of socialist society.

As are all Soviet people, I eagerly became acquainted with a flow of new facts, evaluations, memoirs and eyewitness testimony, works by writers and journalists, films and plays. However, the voice of scientists has been hardly heard in this deluge of information. The Nauka Publishing House and academy journals covering history are intolerably slow in restructuring.

I am convinced that academy science could make marked contribution to raising, to a fundamentally new level, the teaching and study of history at VUZes, schools, the system of political education and the quality of training aids and programs. This not only means survey academy works becoming the basis for the preparation of texts, but also that historians themselves—associates at academy institutes—participate in writing such texts, where historical facts and the entire fabric of domestic history be illuminated convincingly and interestingly, from precise worldview.

[Question] At the meeting there was practically no criticism of economists.

[Answer] Actually, there have been positive advances in economics. Economists are working on key questions in radical economic reform, the forecasting and modeling of the social and economic development of our country and the restructuring of the national economic complex. Together with the State Committee for Science and Technology many departments of the academy, including our economists, are working on the Comprehensive Program for Scientific and Technical Progress in the USSR during 1991-2010.

However, I would like to note that the positive advances in economic science are still not commensurate with the tasks posed by practical work in radical economic reform.

Recently the USSR Academy of Sciences' Presidium examined the preparation of several scientific and technical programs and approved some of them. However, with regard to these programs in general, I should say that their formation is being delayed and only listlessly undertaken.

The situation is made more difficult because, starting in 1989 academy institutes should convert to financing of research program approved problems.

In conclusion I would like to note that our results could be more significant if we were to overcome shortcomings in the material base for research, in scientific instrument building and material-technical supply. Our work is also hindered by rigid organizational structures, the lack of dynamic reactions to newly arising directions in science, stagnation in cadre policy at institutes, bureaucraticism and an inflexible management apparatus.

The perestroyka begun at the USSR Academy of Sciences is directed at overcoming these. It requires participation by each scientist and specialist and each associate in the academy apparatus. Perestroyka begins with people, their initiative, civil activities and responsibilities.

11574

Need for Methodology in Teaching Technical Creativity

18140239d Moscow NTR in Russian No 6, 1988 p 6

[Article by A. Popov, chief specialist on questions of improving qualifications, VOIR [All-Union Society of Inventors and Rationalizers]: "Creativity is Required"]

[Text] **Engels once very accurately noted that when a need arises in industry, it advances science faster that do dozens of universities. These words fully apply to scientific and technical creativity. Without going into the**

history of the question, I will only recall that the demand for intensive technology and inventions became more urgent during the Second World War, when technical innovations were needed in a hurry. At that time, the 1940's, engineers and researchers in various countries proposed the first "industrial" methods of research for technical ideas and solutions. There are now dozens of methods (especially popular are brainstorming, morphological analysis, sinetika [Not further identified], algorithms for solving inventive tasks—ARIZ—and others).

The largest scientific research and planning design firms taught these methods to their leading specialists. Engineers started working professionally in the search for new technical solutions. Today in practically all industrially developed countries there are consulting firms "trading" in modern technical creativity and "producing" new technical ideas and solutions. Are these services in demand? Yes, and how! It is sufficient to note that although the firms are small, their turnover is in the millions.

What is happening among us, where since the beginning of the 1950's several original methods have been created? I have already mentioned G. S. Altshuller's ARIZ. At about the same time G. Ya. Bush developed the so-called septuple search method, M. F. Zaripov proposed his energo-information method for the analysis and synthesis of technical solutions, A. I. Polovinkin generalized a heuristic algorithm for finding new technical solutions, etc.. Thus, even though we have our own theoretical base we are lagging in the mastery of modern methods for technical creativity.

Think about this. Today in our country there is less than one innovative proposal per seven specialists with a higher or secondary specialized education. We will attempt to link this embarassing figure to the number of items mastered annually. According to data on Soviet machine building, in 1950, 500 standard units of products were mastered, while 3 decades later the figure was 4,000. Also, new items are becoming more complicated and require ever larger numbers of new technical solutions. Equipment is becoming obsolete more quickly, making necessary its more rapid improvement.

We increased the number of engineers so as to somehow speed up the growth in technical indicators. Statistics show that the growth rate in the number of engineers outpaces that of all other specialists. If it continues, in the near future the country's entire population will be employed in creating new technology.

I have often gone off on assignments or given lectures and exercises on methodology for finding new technical solutions. Based upon my past and present experience I can say that only now, at the start of perestroyka in the economy, have we begun to form a social demand for creativity. Of course, previously there were enthusiasts who were interested in methods and eagerly working at inventors' schools. However, they were not so enthusiastic about production.

It is hoped that there will not be delays in the formation of a social demand. This is all the more important because we are not starting from a blank slate. A public and state system for training people in methods for finding new technical solutions has evolved in the country. It began with school, where the methods' discoverers themselves taught. When experience and a sufficiently large number of specialists capable of teaching on their own had been accumulated, teaching began in public and state educational institutions.

Institutes for improving qualifications began to train engineers in methodologies for finding new technical solutions. At Goskomizobreteniy [State Committee for Inventions and Discoveries] Higher State Courses for the Study of Patents and Inventions (VGKPI) they set up a new training program "Improving Creative Activity in the Process of Making Scientific and Technical Decisions." The VOIR has its institutes for technical creativity.

True, some will see a contradiction in how I have just talked about how badly we are lagging in mastering methods, and then go on to explain the system for teaching technical creativity. There is no contradiction. The problem is that the existing system's capacity is clearly insufficient. We were able to train only a few thousand engineers, while the country needs millions. Also, the existing system is slow in engaging in the process of forming creative thought. We are working with adults. Like it or not, the character of a developed specialist is influenced by stereotypes.

In my view a three level continuous system for training in the methodology of technical creativity should operate within the framework of the general system. The first level would cover pupils, students at PTU [Professional-technical academies], other students and young workers and young specialists. The task here is not so much to teach them to use methods as to instill them in creativity.

The second level would be for designers, technologists, inventors and innovators, that is, for those who directly participate in creating and improving equipment. We should teach these people how to use modern tools for intellectual labor in order to solve research problems.

The third level is the apex of the pyramid. It is for training a new type of specialist—engineers in the methodology for finding new technical ideas and solutions. They will be called upon to organize and lead collective creative processes at enterprises.

What is there today? The second level, perhaps. It is being carried out at institutes for improving qualification, VGKPI and VOIR institutes for technical creativity. There are no first and third levels as such. This is understandable. A psychological climate suitable to technical creativity has not been created.

As an experiment we tried to train professional "searchers", but were faced with the problem of where to train them in specialities. The time will come when thousands of such specialists will be needed and will have to be trained. What will be done with those who are already capable of working professionally? Without work they will loose their skills. I think that at some time we could assist engineering-technical cooperatives. Perhaps the new profession will begin at such cooperatives.

11574

More Independence and Foreign Ties for Laboratories Urged

18140236 Moscow LITERATURNAYA GAZETA in Russian No 11, 16 Mar 88 p 12

[Article by Maksim Frank-Kamenetskiy "Why are Scientists Silent?"]

[Text]**Maksim Frank-Kamenetskiy, the author of this article, is a doctor of physical-mathematical sciences and an active member of the New York Academy of Sciences. He is head of a sector at the USSR Academy of Sciences' Institute of Molecular Genetics and teaches at the Moscow Physical-Technical Institute.**

Perhaps scientists really have nothing to discuss other than deeply professional problems? Perhaps the condition of basic science is excellent and the entire problem is that the outstanding discoveries of our scientists are being poorly introduced? These ideas are well cultivated in the minds of the broad public by our scientific establishment. Moreover, it is asserted that glasnost and democratism are inherent to science and have long held unshared power in the scientific world. It is reluctantly admitted that, at one time, in the reign of Tsar Pea, there was this charlatan Lysenko, but this was only a brief indisposition and nothing more than ORZ [acute respiratory illness] not affecting the health of our glorious Academy of Sciences.

Some people seeing the poor state of our science from the inside naively hoped that at the March 1987 Academy general meeting there would be a serious discussion, at least remotely similar to those which took place at congresses of workers in film, the theater and literature. Vain hopes! The meeting followed the usual scenario. As always, the vice president reported about "further" successes and academy members speaking at meetings dutifully repeated him. Incidentally, we associates at academy institutes only heard about this second hand, as only academy members (full and correspondent) and directors are allowed at meetings. This is "democracy" academy style. The result from standing of democracy on its head is to remove from the decision making process those who are today really doing science, not only rank and file associates, but also scientific leaders. They are not even allowed to participate in the discussion of candidacies for sections during the December 1987 academy elections. True, as we later learned, at the general meeting there was quite a heated discussion about some candidacies to the academy—three of them failed. (To be more specific, not without the intervention of the press). Wouldn't it be better to organize genuine discussions of candidates at sections, widely attracting those who are actually doing science and who know their colleagues' real value?

Just as a living organism is made of cells, a scientific "organism" also consists of elementary cells, each of which is a laboratory, a sector, group, chair—the name is not important. What is essential is that there be a clearly defined elementary cell headed by a "chief"—a zavlab [laboratory leader]. The chief is always a noted scientist who has earned a reputation in some field of science. At one time he had his own chief, who in turn had his, and so on.

The productivity of science is determined by the productivity of its cell-laboratories. But what is a science product and science commodity?

The most important feature of a science commodity, a producer's work delivered to the masses, is that it does not acknowledge countries' borders and customs barriers. Attempts to divide science into "ours" and "foreign" have been repeatedly made, but this inevitably leads to catastrophic results. The most vivid example is Lysenkoism.

The extraterritoriality of science means that no matter where scientists work, in the United States or in the Central African Republic, the same demand is made upon them. Either they produce world class products or none at all. There is no third alternative. However, it is not enough to produce a science product, it must be sold and realized.

How can your commodity, your scientific work, get attention? Above all it must be felt that each system of indicators will be deemed convincing for a given stage in the development of a specific science. This feeling can only be the result of the highest professional evaluation. This places even more importance upon the role of a science school, scientific leader and laboratory leader. Truely, like Pope, like people!

A market is a market. Whether this pleases us or not, the features of the market for science products are much like those of other world markets. Many of them are unjust, even discriminatory, but often the simple fact that the work was done in a given laboratory, that is, under the

trademark of a certain firm, is sufficient for the research to immediately attract attention. On the other hand, work done at a previously unknown laboratory will have a very hard time making its way.

We stress once again: a result in science is recognized work which contributes to knowledge. How does one find out if a science commodity will be in demand or if it will only remain on the pages of science journals? After all, completed work in science does not bring any direct financial rewards to those who do it. Are there objective criteria?

The measurement of work in science does not have a universal criterion such as profit in the economy. One nevertheless does exist, although it is far from irreproachable. This is the famous Hartfield "citation index" which lists in alphabetical order (last name and initial of the first author) all articles cited at least once during the year in all journals throughout the world.

There have been repeated attempts to include the citation index among the factors taken into account when certifying a scientific associate, as is done abroad. However it has not become part of our scientists'councils' practice. Many people considered it tactless to even mention the citation index of a person being certified. This was earlier, when certification was open [glasno], at scientists' councils. After the 1986 reorganization scientists' councils no longer participate at all in science certification. A new organ was created for this—the certification commission, appointed by the director. Its majority consists of representitives from the administration and public organizations. The scientists' council meetings were open [otkrytyye]: people attended, listened, talked (only council members voted). The certification commission meets behind closed doors. Only laboratory leaders are invited. The fate of those being certified is decided without them.

Did those who thought out and implemented this reorganization see what they were creating? Yes. As was repeatedly stated, its goal was to give the director all power in an institute and to strengthen the principle of one man management.

Even though less than two years have passed since the reorganization, unceremonious intervention by directors in laboratory matters has already become the norm. With the help of a certification commission subservient to his will, the director himself decides what position and what salary an institute associate should have. Naturally, there are conflicts.

I hear the voice of the experienced reader, saying that the perestroyka now underway cannot take place painlessly. Yes, some laboratory leaders are not happy with the reorganization. After its completion a formless conglomerate of small laboratories at an institute is converted into a monolith, capable of solving any task at the director's will.

Does this sound alluring? Why not make the institute, instead of the laboratory, the scientific cell?

However, a collective hundreds of scientists strong cannot become the elementary cell of science. The functions performed by a genuine leader of a cell (the numbers of which are increasing with the scientific and technical revolution) presume that he himself is professionally and productively engaged in science and is not spending time on unavoidable administrative concerns.

What about the behavior of a leader at an institute converted to the new conditions? For his reputation's sake, he tries to work only on the simplest tasks, not fraught with risks and responsible decisions. He spurns important problems in any way possible. The basic instinct of self-preservation dictates that he get rid of everything inconvenient and all who do not blindly subordinate themselves, but require reasons. At the very least he will do everything to shut their mouths. Gradually he will completely cease to reckon with public opinion and actually become transformed into a dictator. In general, it is sufficient to shut up a few of the most respected and recognized individuals "regardless of previous services" for the rest to become reluctant to stick out their necks. Scientists are thoughtful people. The whispers will flow through the institute,"they have already been broken...." It will become quiet as a morgue.

Yes, give this perestroyka a couple of years and science can be turned into a genuine desert, just like it was before. It's time for the guards to cry out.

What is the solution?

Perhaps academy institutes should be removed from the suffocating petty supervision of academicians and divided up among the ministries?

God save us! No matter how bad our academy science is, the agencies are one hundred times worse. Innumerable bureaucrats of all ranks work in them as if they were drawing their last breath. What will another campaign to strengthen discipline cost? In fact, to eradicate science as quickly as possible one simply has to force all associates to arrive and leave the laboratory on time. This will first of all affect the most fanatical, those who often work in the laboratory for days at a time and then go home to catch up on their sleep. Clearly, with the present primitive consumer's attitude the ministries have towards science, the academy institutes would quickly expire.

Perhaps science can be distributed among educational institutions?

In contrast to us, in the West basic science is concentrated mainly in the universities. Therefore many think that the reason for our science's poor health is its separation from higher education. Actually, this is very harmful, but to higher education and not to science as

such. The productivity of scientific research institutes in the West often leaves that of universities far behind. The most vivid example of this is the IBM institute near Zurich, in which only 40 physicists are working. For two years in a row (1986 and 1987) associates here have been awarded Nobel Prizes for Physics. Two of them received the prize for the world shaking discovery of high temperature superconductivity. The reason for such productivity at this small "sectoral" institute is that its associates have more freedom of creativity than those at universities. The more independent and free the scientific research the more generous its returns—this is a law which has long been mastered by the "sharks of world capital."

The solution is complete independence for laboratories. An institute would be kind of a scientific cooperative, led by a "council of shareholders", as previously, let it be called a scientific council. It should become a genuinely legislative organ. (The scientific council is still an advisory appendage to the director, after a pseudoperestroyka it has lost even its certification functions). It should include laboratory leaders and the most gifted scientists.

Obviously, without independence in finding resources resources for its research a laboratory can hardly produce. Where can it find them? There are many sources: domestic and international funds especially created to stimulate basic research. There are also ministries interested in various developments.

Of course, an institute should have base budget financing—to maintain a modest administrative apparatus and to pay members of the scientists' council. All remaining resources, including money [valyuta] for equipment, supplies, sending associates on assignment within the country and abroad, and for paying them are provided by each laboratory leader, just like in the West.

In order to get money from a fund a laboratory leader naturally must interest it in his scientific ideas and proposals. The fund council, well known scientific experts working on strictly limited time, say 2-3 years examines it and presents it to six people, including foreigners, for scientific reviews. (We can finally get rid of the sciencemafia, which has poisoned the atmosphere in our science.

I can hear the bureaucrats' howls: "What a leakage of information. It could be misappropriated!" In order to prevent this six reviewers are required. Knowing that the same proposal is being examined by five colleagues, nobody will take this suicidal step. This system has already proven itself in practice. Everybody knows that firms in the United States are implacable competitors with those in the FRG, for example. At the same time West German scientists acknowledge that as a result of using foreign, primarily American colleagues, to evaluate their proposals, science in the FRG decisively broke out of its stagnation. Americans also send their proposals throughout the world. I myself had a chance to evaluate proposals presented to the National Science Foundation in the United States.

It is my deep conviction that foreign reviews are an absolutely necessary condition for the entire proposed financing system. Without them we will not succeed in quickly raising the level of scientific research in our country. A delay is equivalent to death.

After receiving notification of a proposal's approval, a laboratory leader selects associates, orders equipment and supplies (which can be used by other laboratories), etc.

What if the proposal is not approved? In that case the laboratory leader will have nothing to do. Moreover, the scientists' council can then even decide that he can no longer work at the institute and must look for work elsewhere.

These are psychological costs and at the same time a powerful incentive to work. A laboratory leader should think about the forthcoming proposal, write a good application and see that the work is done.

I foresee objections of a purely practical nature.

The main one is how to make this system, threatening the massive transfer of people, compatible with the existing registration system? I emphasize that this rotation of people, not only within the country but also to other countries, will in itself provide a powerful impulse to the development of science and the mutual enrichment of ideas and methods. Our science cannot be improved without it! Therefore constraints on scientists' movement should be eliminated!

What about science schools? Some may say that with the transition to self-financing it will be difficult to save old and form new schools. I am convinced that this is not a real danger. Foreign experience is proof of this. What really will happen is the disintegration of the powerful science mafias smothering our science.

It is said that the proposed system is utopian. However, it has been working excellently for many years in the West. Most importantly, we have no other way out.

Admittedly, I myself feel nostalgia for the good old days, when the Academy was an oasis for science. However, such idyls have are a dead end. What is really utopian is to hope for their return through bureaucratic shakeups, leaving unchanged our science's patriarchical organization. These are not only my guesses and deductions. Many think the same way. Why are we all still silent? After all, different times are ahead...

11574

Economical Use of Protein Research Materials

18140233 Moscow PRAVDA in Russian 13 Mar 88 p 3

[Article by Mikhail Vasin under the rubric "Notes of a Commentator": "Crumbs From the Table of Science"; first paragraph is PRAVDA introduction]

[Text] Professor R. Nalbandyan had been pondering for more than a year over such a strange theme: academic science and commerce. No, the professor does not have anything to do with either economics or finance.

His laboratory of the physical chemistry of proteins (the Institute of Biochemistry of the Armenian SSR Academy of Sciences), although busy with entirely terrestrial problems, is conducting scientific research on such distant approaches that from real practice, as they say, one has to travel 7 versts and all through woods. Nalbandyan and his colleagues are studying how a shortage or excess of metals in the body affects its vital activity. For example, in case of an increase of the amount of manganese in the blood of man symptoms, which are reminiscent of one of the serious diseases, appear; but one only has to eliminate the excess, and the "illness" disappears. Nearly every other person, who suffers from diabetes, needs not so much insulin as to regulate correctly the ratio of three metals that are contained in his tissues.

By studying similar phenomena and facts, the laboratory suggests to applied scientists (medicine, agriculture) the directions, in which research can yield a substantial practical impact. For the present the physical chemists themselves do not have the forces to bring their ideas to a logical conclusion—introduction. As we see, they activity also does not smack of any economics, it is merely implied in the future, in the work of other scientific institutions? Why do economic questions worry Professor Nalbandyan?

It turns out that his field of knowledge (it is called bio-inorganic chemistry) is at the spearhead of world scientific progress—it is developing just as rapidly as the now celebrated biotechnology. The laboratory has to work all the time with new metal-containing proteins. But what does it mean to obtain a specific protein? It is necessary to discover it among thousands of others, to extract it, and to ensure ultrahigh purity. In order to accomplish the task, the associates of the laboratory are developing unique "technologies" and are devising a hardware design. A special instinct and intuition are required—preparative chemistry in many respects still remains an art.

And now the preparatory stage is behind. Miniature vials are filled with the precious preparation and are sealed. Having made the necessary amount of protein for his own research (let us say 1 gram), the scientific associate closes his "works."

But other research institutions need this preparation, yet far from all can make it. Is it not more wise also to produce several vials for them, if the "microenterprise" has already been set up and is operating?

In recent years the associates of the laboratory have also been doing it that way: you made a gram for yourself, make the same amount for others. Especially as both scientific centers of our country and foreign scientific centers are willing to pay well for this—having obtained a ready-made preparation, they save time. The laboratory as a sideline produces "protein products" for 80 clients, earns in a year up to 100,000 rubles, and saves currency.

Having such "receipts," the laboratory obtained the right to hire eight laboratory assistants and workers. Thanks. But twofold more technical personnel are needed here in order to increase the pace of research. Substantial assets for the purchase of equipment are also needed. The available reserve is already making it possible to produce 30-40 preparations and to increase revenues by four- to fivefold. Moreover, without detriment to basic scientific activity, only "tying up" a hour or two overtime.

"However, in practice it is impossible to accomplish this," Professor Nalbandyan grieves. "However much the laboratory earns, it 'is not supposed' to have more laboratory assistants. The money, which is intended for the purchase of equipment and has not been spent, at the end of the year is confiscated, so that it is impossible to save up for an expensive instrument. It is prohibited to stimulate materially the academic scientists who are engaged, in addition to their official duties, in the output of 'commodity' production; it is prohibited to hire supernumerary scientific associates.

"A small scientific production association should be organized under the republic academy," the professor shares his dreams. "This would enable us on a legal basis to take the path of if only partial self-support [samookupayemost] and simultaneously to create the material conditions for the expansion and extension of basic research, the introduction of our own developments 'with our own hands'...."

But no matter with whom he spoke about this at the republic academy, the matter made no headway.

After the conversations with Professor R. Nalbandyan "economic reflections" also began to overcome me. I remembered that people, who know what the price of bread is, after dinner carefully gather the crumbs from the table. A sacred thing! But during "scientific dinner" crumbs that are far more valuable than both bread and gold remain on the tables, particularly of the laboratory of the physical chemistry of proteins: a gram of preparation costs 1,000 rubles and more. Is it really necessary to brush them casually onto the floor because it is more customary that way?

I shared my doubts with L. Gervits, chief of the Planning and Finance Administration of the USSR Academy of Sciences. He agreed that the habit of spending assets lavishly and of missing a possible advantage is a poor adviser under the conditions of restructuring.

"But now old habits tell not only in this," he added. "The habit of scientists of not looking too deeply into economics and into the new conditions of economic management has become very noticeable. This is also evident from what problems Professor Nalbandyan cannot solve. But according to the now existing regulations efficiently operating scientific institutions have the right, by using the wage fund of the academy and even interested ministries, to hire both scientific associates and technical personnel and to establish substantial salary supplements. The scale of such changes is determined only by common sense and expedience. Previously it was also possible to save up assets for the purchase of scientific equipment—such a mechanism existed. Starting with the new year the solution of this problem has been facilitated and simplified even more. Finally, the suggestion of R. Nalbandyan on the establishment of a scientific production organization in the system of the republic academy. Life itself is prompting us to similar steps. And the question of establishing a cost accounting introducing firm is being discussed among the staff of the Presidium of the USSR Academy of Sciences...."

We will hope: if the matter also proceeds this way in the future, we will cease soon and really to sweep golden crumbs to the ground. If, of course, the rules of economic management at the Academy of Sciences are not surrounded from all sides by stipulations: for it has been known for a long time that stipulations repeal laws.

7807

Improvement of System of Dissertation Defense

18140234 Moscow IZVESTIYA in Russian 10 Mar 88 p 2

[Article by Doctor of Technical Sciences Professor L. Sorin: "How to Defense Dissertations. Collectivity Is Being Replaced More and More by Secrecy in the Work of the 'Certification Combine' of the Higher Certification Commission"]

[Text] Anxiety is now often heard in the statements of leading scientists. The country is beginning to experience a shortage of scientific personnel of the highest skills, the low quality of dissertations is causing alarm, a enormous number of them are written most likely only for the sake of obtaining an academic degree. In many respects this is a direct consequence of the bureaucratic and faulty system of the defense of dissertations, which the Higher Certification Commission—the VAK—has been fostering since 1975.

Now we already have several thousand specialized councils for defenses of doctoral and candidate dissertations. They have been established at practically all higher educational institutions and scientific research institutes. The idea of an efficient system of specialized councils as an effective means of certification was distorted in the pursuit of quantity. Many specialized councils were established purely formally according to just one principle—the presence on them of the proper number of doctors and candidates of sciences, although it is clear that it is possible to entrust certification to far from every scientist. As a result many specialized councils have ceased to enjoy the trust of the scientific community, because there are not enough objective and demanding scientists on them.

The Higher Certification Commission is now developing a two-level system of certification. About 50,000 doctors and candidates of sciences now work at the first level—on specialized councils. The second level is 200 workers of the staff of the Higher Certification Commission, who have been attached to science, and several tens of expert councils and experts—about 2,000 more doctors of sciences, whose task is to monitor the work of the specialized councils and the quality of dissertations.

It is possible to depict the existing "certification combine" as an enterprise. Some 30,000 candidate dissertations and more than 3,000 doctoral dissertations a year are the product of this "combine." While this is about 8 million pages of scientific texts and approximately 3 million pages of dissertation files of the degree seekers. All these products come to the second "shop of the combine"—the Higher Certification Commission proper, where "inspectors" go to work.

As practical experience shows, annually about 150 doctoral dissertations and the same number of candidate dissertations are "rejected." All 3,000 doctoral dissertations and, apparently, not more than 1,000-1,500 defended candidate dissertations are checked. The 2,000 experts, who are employed in official capacity in basic staff work, are physically incapable of doing more. But it is becoming clear that the unchecked 28,000-29,000 candidate dissertations contain the same 10-15 percent rejects. And, consequently, our society given the seemingly strictest system of checking annually "acquires" not less than 4,000-4,500 "defective" candidates of sciences!

In the final instance the Presidium of the Higher Certification Commission decides the fate of doctoral dissertations. But how? In all 60 doctoral dissertations and the same number of dissertation files are submitted to the weekly meetings of the presidium, which last 3-4 hours (let us recall that on the average 3 dissertations are rejected at each meeting). A simple arithmetic calculation shows that the fate of each doctoral dissertation and the fate of the degree seeker are decided by the presidium...in 2-3 minutes!

The collectivity and glasnost, which have been declared by the Higher Certification Commission, are frequently violated for the benefit of group and personal vanities and interests of individual workers of the staff. It has been replaced by secrecy—the beaten path to all kinds of offenses, falsifications, and forgeries, which have been repeated reported in the press. In recent years the staff of the Higher Certification Commission has begun more and more purposefully either to replace the expert councils or, on the contrary, to reassign their functions to them, shifting onto them the legal responsibility for the conducting of certification. The boundary between the staff of the Higher Certification Commission and the experts of the second level of certification has begun to erode.

The majority of scientists regard as offensive for degree seekers and everyone, who took part in the public defense of a dissertation, "the backstairs, anonymous opposition" of the Higher Certification Commission. This gave rise to abuses and impunity for erroneous, and at times also malicious actions. The anonymous system of checking by "the supercorps of secret advisers" of the Higher Certification Commission, which has gained strength, is absurd.

Life suggests: revolutionary solutions and the critical review of our system of certification are required.

Academician V.S. Avduyevskiy ("Why Sciences Is Aging," IZVESTIYA, No 42, 1988) proposed that the system of certification be a one-level one, as in the majority of foreign countries, where academic degrees are conferred in the first and last instance by councils of scientists, which are elected only at highly authoritative scientific research institutes and higher educational institutions. Candidate diplomas and diplomas of doctors of sciences should be issued only on behalf of precisely these councils. The activity of such councils does not require constant checking. They themselves should have quite adequate skills in order to reliably protect their authority not only in their own country, but also abroad. Precisely such councils should also be set up in our country. The USSR Academy of Sciences and the USSR State Committee for Public Education should decide to which scientific research institutes and higher educational institutions the right to certify scientific personnel can be granted.

In recent times the work of the Higher Certification Commission has been seriously criticized. And in response to this attempts at "cosmetic repair" instead of radical restructuring, which would conform to the interests of the matter, have been made. It is clear that the excessively expanded, awkward monitoring staff will not be able to replace open demanding certification in highly skilled councils. The changeover to a one-level system of certification, in my opinion, has become vitally necessary.

7807

Management Reform at Institute of Management Automation

18140235 Moscow MOSKOVSKAYA PRAVDA in Russian 3 Mar 88 p 2

[Article by A. Kolesnikov under the rubric "Learn Democracy:" "The Election at the Institute;" first paragraph is MOSKOVSKAYA PRAVDA introduction]

[Text] At the All-Union Scientific Research Institute of the Automation of Management in the Nonindustrial Sphere they decided to reform the system of management. This collective was all but the first one which decided on such a step in science—perhaps the most difficult area for similar experiments.

The Law on the State Enterprise existed at that time only in a draft, which had been discussed nationally. No one put pressure on the quite successful institute from above. And all the same there is an election. Why?

The opinion of Director V.V. Solomatin:

"I will cite the opinion of psychologists. They have come to the conclusion that a good microclimate in the collective is worth 25 percent of the wage. In other words, people will not leave an organization with a satisfactory sociopsychological climate for a place where they promise an increase of the wage by even a quarter as against the former wage. But the election of a manager directly influences the climate of the collective.

"Democratization was necessary for our development and economic acceleration. Precisely at that time the management of the institute set the goal—the attainment of 100-percent conformity to the world level of the output of products, moreover, not in the estimations of specialists, but in the estimations of the world market. For this cost accounting was sped up. It was decided to distribute the wage fund among departments for themes and for specific scientific developments. And it is the affair of the associates themselves with what number and ability they will complete these developments. The associates of the institute also distributed the wage increments and bonuses—on the condition that they succeeded in saving. This was unusual and difficult. For the problem had always been solved by the manager in consultation with the trade union committee, legislation in principle insisted on this."

At the very start of the assimilation of cost accounting the director came to the departments and laboratories and said: "Inasmuch as previously I divided the wage, I will tell you about my experience. Whether or not you take it into account is you business, but I would like you to study it."

"And it was in these unofficial discussions that they began to ask me: 'But when, Valentin Vasilyevich, will be begin to elect the chief?' I became curious: 'Does the chief not suit you? Tell me, perhaps I will also be able to

settle this question without an election.' 'The chief suits us, most likely we would elect again precisely him. But to work with a person appointed by you and a person elected by us is not the same thing.'"

Cost accounting is quite rapidly pushing out of science people who do not know how and do not want to work. Those who remain realize the need for democratic changes, for only they make it possible to work and earn under the new conditions. The special nature of the VNIINS [All-Union Scientific Research Institute of the Automation of Management in the Nonindustrial Sphere] is such that it has been operating for more than 15 years now on partial cost accounting, and the majority of the painful processes, which other institutes still have to experience, are coming to an end there. People, for whom the necessity of democratic methods of management does not evoke doubts, remained at the institute.

The institute is taking part in the solution of the most important national economic problems. The introduction of a system of the management of freight transportation at just one railroad junction—the Ekibastuz station—frees daily 147 railroad cars and, consequently, saves more than 1 million car-hours a year. On the order of the USSR Ministry of Health the statewide automated system of the monitoring of environmental quality, which encompasses 180 cities of the country, is operating.

Much attention is being devoted to the needs of Moscow. The institute developed and has begun to introduce at polyclinics of Sevastopolskiy Rayon an automated system of mass routine examination. The introduction of automated information processing systems at the savings banks of Sevastopolskiy Rayon decreased to one-fourth the time of service of clients....

Thus, the management of the institute arrived at the need to hold an election.

"I met with the managers of all the services," Valentin Vasilyevich relates. "Of course, I could not say to any of those sitting in my office: 'Let us begin with you.' And I sensed that I could not get away from the phrase: 'Let us elect a director.'"

The director understood that if they did not elect him to the former position, despite the opinion of the collective he would not be able to hold it (although formally such a possibility existed—the Law on the Socialist Enterprise at that time has not come into legislative force).

The difficulty of the position of the director also consisted in the fact that, undoubtedly, it seems to the people, to whom first of all they had granted the opportunity to decide themselves, that they are obliged to decide everything all over again. The people, whom over the decades they broke of the habit of expressing their opinion, will seize upon such an opportunity and at first will hardly be able to cope with it. The only means of resolving the situation is to afford such an opportunity. It is necessary to go through this.

The difficulty was aggravated by the objective circumstance that in such a job it is impossible to preserve smooth relations with everyone. The personal qualities of the director might not have suited.

The draft of the law envisaged a conference or meeting, a secret or open ballot. In the collective they discussed the procedure with enthusiasm for nearly a week. They came to the conclusion that the associates would receive the voting papers at 0900, then everyone would part for their workplaces, by 1400 they would come and would vote secretly. Whoever does not want to vote can simply not appear at the voting place. There were many disputes about who can propose a candidate and how. They decided simply: whoever wants to propose stands up at the meeting and proposes. The only condition is that it is possible to declare whoever agrees to stand for election.

The joint meeting of the trade union committee and the party committee nominate V.V. Solomatin by the now forgotten roll call vote—everyone should have given reasons for his choice. The discussion of the candidates began with the associates of the institute attempting to understand what the director should be like. Practical qualities were rated quite highly, but obligingness came out in first place. Such a surprise, however, is natural: under the conditions of cost accounting obligingness is becoming an economic category.

The primary surprise: after the discussion only one candidate remained—Valentin Vasilyevich Solomatin. In the election he received 93 percent of the votes. The associates, who did not come to vote (these were the remaining 7 percent), at the suggestion of the director were qualified as having voted "against."

The experiment did not lead to a formally new result—the director remained the former one. And all the same changes did occur. The necessity of further democratic transformations became obvious not only for the director and rank and file associates of the institute, but also for middle level managers. Although for several of them necessity merged with the concept "inevitability."

"Our science—the development of automated management systems—is collective," V.V. Solomatin says. "The end result depends on a large number of people. Consequently, according to the theory of large numbers, the average scientist moves our science. We should provide him with normal conditions for work. First of all he should have an interest in this work. This is otherwise called the sense of being the master and involvement in the end result. So that a person would not lose the ability to express his opinion, he should have the right to take risks and even to make a mistake. It is necessary to ensure the use of the developments of a scientist in practice. Psychologists believe that during work basic

researchers are never interested in the possibility of using in production the results of their labor, but gradually lose interest in unsolved problems, if such application does not exist. Finally, the right to a nontraditional point of view is necessary. If we are deprived of the diversity of points of view, the basic spring of progress will disappear."

At the institute it is possible to hear various interpretations of this problem. But all the opinions agree in the main thing: the old model of management—managers and the managed—has become obsolete. The sense of being the master arises only if each scientist feels responsible for the results of his labor.

It was difficult for V.V. Solomatin. He decided on an election from top to bottom at the height of work and could not allow even a temporary decrease of the growth rate of labor productivity and the nonfulfillment of the plan. But the election of chiefs of departments and laboratories lay ahead, and people, who are popular, but not capable of ensuring the necessary result, theoretically could hold these positions. Under different conditions, if there were time, this would be acceptable. The voters would quite soon understand their mistake, a new election would be held, and everything would take its own course. But rapid development required a different approach.

"At the institute there are 15 departments and 50 laboratories," A.A. Mamontov, secretary of the party committee of the institute, relates. "They agreed to hold the election in accordance with the same model as the election of the director. At the general assembly they talked over the procedure. They decided as follows: first a discussion in the department and laboratory. Then the party committee and the certification commission approve the candidates for voting, thereby reducing to a minimum the possibility of a mistake. At this stage the problem was to identify the people capable of managing, but not to appoint them. The collective should have made the choice.

"The party committee and the certification commission ventured to eliminate several candidates who in principle are not capable of performing the job, for which they were nominated. The director announced a daily 2-hour reception on election issues. In addition, at the request of the trade union committee and the party committee, a mailbox, in which everyone could drop his remarks, wishes, and suggestions, appeared."

"Let us imagine that the department elected a person, who would seem to you incapable of managing...."

"We tried to make provision for such a possibility. The collective gave me the right, if I did not agree with the result of the election, to appoint a person to carry out the duties for a term of a year with the mandatory repetition of the election."

"Well, what if the associates of a laboratory did not come to an agreement with each other on whom to elect? Or the party committee did not come to an agreement with the department?"

"They gave me the right to make the final choice. In an extreme situation I could make the decision on the dissolution of a subdivision altogether. But I did not have to resort to such a step."

It turned out that it was not necessary to fear that the collective would elect a convenient, undemanding person who would make it possible not to work. Thus, the subordinates of one of the managers, whom, as the director believed, they would elect without fail, advised him not to advance his candidacy. "A nonobliging, undemanding person—he can state three or four times and not achieve the fulfillment of his demands. It would be fine if he did not make demands on us, but he also does not make demands for us." The qualities of a manager are turning into a material factor.

As a result of the changes the transfer of three chiefs of departments and several chiefs of laboratories occurred. This happened back before the election: neither the managers themselves nor their subordinates wanted to propose candidates for reelection.

Thus, cost accounting relieved significantly the pain of the processes of democratization. But how did the changes affect the output of products? Here it is possible to trace interesting regularities. According to the estimates of state commissions, the share of developments, which correspond to the world level, came to 68 percent as against 60 percent the previous year. This year the institute plans to increase it to 80 percent. Labor productivity increased during the past year by 18 percent. The growth rate of the wage is 6 percent, that is, a third as great as the growth rate of labor productivity, which is very important for economic development.

Thus, the director and the collective are attaining a modern level of contact. What does this signify?

"It is necessary to report one's point of view to the collective, if it is critical and affects the interests of all people, before an order for the institute appears," V.V. Solomatin is convinced. "It is necessary without fail to talk with the collective, to answer questions, and to find out whether everything is suitable in the decisions which depend on me.

"Rational arguments are not always persuasive. At times people agree with me only because they do not agree with others. The labor intensiveness of a democratic decision is much greater than the labor intensiveness of an authoritarian decision. Take just the technical aspect: it is necessary to bring the collective together, to prepare documents, to hear a large number of contradictory points of view.... Therefore, the role of institutes, which are tested and have been operating a long time, and first

of all of the party organization, which today needs to do what previously was often only spoken about—to head the collective—is increasing significantly."

For the development of science it is necessary to revive in the scientist the sense of self-respect, which, in addition to one's self-worth, provides a direct transition to a completely different product quality—what is now so necessary. How is this to be done? There is one means—respect for the scientist. Science requires the free exchange of ideas and the independence of the individual. And for the present nothing else except democracy has been thought up for the development of science.

7807

Conversion of Research and Development to Cost Accounting

18140208 Moscow SOVETSKAYA ROSSIYA in Russian 27 Dec 87 pp 1-2

[Interview with V.V. Solomatin, by Aleksandr Nemov and Georgiy Georgiyev: "Intellect on Cost Accounting"]

[Text] **Isn't it better for us to concentrate all the country's efforts in the Academy of Sciences and VUZes, as several Western countries do? This is the question with which we began our interview with V.V. Solomatin, director of the All-Union Scientific Research Institute for the Automation of Management in the Non-Industrial Sphere.**

TREATMENT BY SELF-FINANCING

I will say why, in my view, we have lagged in some directions of science and technology and why we need to close entire scientific research institutes. First something else. If one looks at sectoral science within a countrywide framework, one sees that it receives more than 80 percent of all material resources allocated for scientific research. Following your logic this is bery bad. The resources should be given to Academy science. They can use it better there. Actually, we do have many laboratories at Academy institutes. This is the fashion in research around the world. It touches all fields: physics, power engineering, chemistry and even microbiology. However, primacy in ideas is not everything. Ideas are undoubtedly needed, they initiate society's systematic social and economic movement. However, the main criteria of value is always practice. If only materialized on paper, brilliant ideas cannot raise society's potentials. A smoothly operating mechanism for their realization is needed. From our own "hard knocks" we are beginning to understand the axiom: The winners are not those who put forward ideas, but those who more quickly get results. Here in the Soviet Union sectoral science is called upon to be the driving link between ideas and production, from drawings to industrial series output. It includes practically the entire cycle which divides words from deeds.

There are equivalents to our NII in any country—research and development firms or special departments at large concerns. Their tasks are essentially similar—develop or buy the most modern technological process and introduce it, improving production. Keep in mind that we have been creating a continuous flood, but "they" have made the widest initial applications. All the "troubles" of our sectoral science lie in this paradox. With its colossal potentials, it is not performing its role. Let's try to understand why. To do this, we turn to a closed NII.

As a deputy member of the Mossovet [Moscow City Council of Workers' Deputies] I had to analyze the work of several scientific organizations. Not long ago, hundreds of associates at GiproNIImash [State Planning, Scientific Research Institute for Machinery] had nothing to do. Why did the USSR Council of Ministers make this decision. The institute was set up to solve a specific problem. Quite a few of our machine building plants have their own antidiluvian shops—for casting and forge and press work. With today's high level of specialization at enterprises, it is simply ruinous to adhere to the principle "hold on to everything you need." In small shops it is unprofitable to install highly efficient and often expensive equipment. Low production volumes will not pay for it. On the other hand, to make steel or or to cast ingots the way grandfather did meant stopping the plant's development. Life itself shows the solution: create, in each large industrial region, powerful intersectoral production operations which would assume all concerns about semifabricates. The advisability of this has been shown by our experience and that of foreign countries. GiproNIImash also should have developed large, highly specialized production.

The years went by and hundreds of associates were working at the scientific research institute, but there were no precise plans for intersectoral production. Institute reports showed that there were increasing numbers of small, unimportant themes. The current tasks of various production associations had been, for the most part, solved. In addition, there were the poor economics: 18 kopecks return on each ruble. The results are known—the NII went bankrupt.

This is another good example of the sore spots of sectoral science: the "drift" from practical tasks to tiny themes. Here, unfortunately, the facts cannot be numbered. From its name alone it clear what work should be done at the VNIIkompozit [All-Union Scientific Research Institute for Composites], USSR Ministry of the Chemical Industry. The use of composites, new structural materials, in the national economy, can save millions of rubles. For many years the sectoral NII in this field has only earned 4 kopecks from each ruble invested.

The saddest part of these situations is that, generally speaking, up until now the existence of such NII was not really threatened by lagging or failures to solve general state problems. The burden was born by the sector or

institute managers and individual collectives. Moreover, if they were called upon to handle intersectoral tasks, there was a conflict. Even newly created scientific-technical complexes were not able to overcome this problem.

The most direct reason for the sterility of sectoral institutes is their existence as hidden extensions of the ministry apparatus. Reports, surveys and instructions pass for scientific research. Not surprisingly, a review by peoples controllers showed that associates at almost half of the sectoral institutes in Russia devote a large part of their working time on activities which should be done by the sector staff or general purpose institutes for work organization and economics.

It must be said that the country's science and technology situation was made more serious by the economic management system. A well known book by T. Peters and R. Waterman, studying the best American companies, includes constant contact with customers as one of the eight characteristic features of effective management. What if scientific progress is not advantageous to the customer and is only cultivated by force, with the help of rigid plans for new technology? Under such an economic mechanism the institutes themselves pose the problems and themselves start solving problems for society. Where this leads is obvious from results of a review conducted by the USSR State Committee on Inventions and Discoveries which showed that our science often works on its own. Developments protected by inventors certificates are used in institutes and laboratories but not extensively introduced even though, according to legislation considerable sums would be paid for them. Last year, 87,000 inventors' certificates were granted, but only one-fourth of these inventions were used. For our colleagues in Bulgaria and Czechoslovakia these indicators are about 45 percent, and in the GDR, over 56 percent.

Moreover, specialists estimate that many (over 80 percent) of NII developments, even those protected by certificates and supposedly, "introduced" ones, have essentially been introduced only on paper, for reports and bonuses.

How can sectoral science be reantimated and turned towards important practical tasks? The only road is through cost accounting. This will acknowledge that the results of scientific organizations' activities have the status of a commodity. Designs, inventions, new technology and even economic methodologies—everything capable ofintensifying production—is a product which can be sold. Recently a CPSU Central Committee and USSR Council of Ministers decree put this into law. Now NIIs will be on full cost accounting and self-financing. Scientific organizations will have to support themselves. If they produce scientific products which are in demand they will have money to pay associates, to expand their research facilities and to build kindergartens and recreational areas. If nobody signs a contract with your NII it means that you did not make it as a scientific organization. Then the institute's existence is questionable. It is not necessary to wait for decades, the results of hundreds of review commissions and millions in losses—the "NII-pustotsvet" [sterile flower
will reach financial ruin on its own. This will be fully within the USSR Law on State Enterprises (Associations), which should also guide sectoral NII.

This way of posing the problem also helps put ministries "on the spot." Now they will have to pay for loading down subordinate enterprises with assignments, as any order requires a contract which specifies the financing. Will the number of institutes decline when sectoral science is converted to cost accounting? I think that it must. Then the remaining NII will work many times more efficiently.

Here one must mention one serious danger. There is not yet an economic mechanism stimulating the production introduction of scientific and technical achievements. The general conversion of enterprises to full cost accounting and self-financing can in time lead to competition among producers, but this is not happening now. The dictates of the producer still predominate. Enterprises do not solve their problems through production modernization and the more efficient use of resources and scientific achievements, but through objective increases in prices. Under these conditions there can be an even greater reduction in demand for science. In addition to the "NII-sterile flower", many very valuable institutes can go to financial ruin and many extremely important developments stopped. This process cannot be left to run on its own.

During the transition period, especially 1988-1990, ministries must be given financial support (possibly in the form of state orders) for applied scientific research. There should be a competitive determination of what projects to finance. This requires the creation of expert councils for key directions in science and technology, the formation of a reserve of experts with a knowledge of world achievements, and money to be allocated to pay them. In the United States more than 30 million dollars (over 1,000 dollars per application) are spent reviewing applications for government budget financed health research grants. We either do not pay for expert review or pay only laughable small sums. This is why we have such an attude towards this work.

I am confident that with time the need for petty tutelage from ministries will decline. Businesslike activities will increase, there will begin to be genuine competitiveness among producers, then there will be real demand for scientific products and cost accounting in science will work with full force. Many skeptics do not believe this. Our experience makes us optimistic. According to sociologists, personal computers can save 35 percent of the work time spent doing clerical work. Previously this research was regarded simply as interesting. Now, with reductions in the administrative apparatus, orders have

piled up all around us. The first were "pushed through" by builders, who converted to cost accounting before others and simultaneously with the introduction of collective contracts encountered increasingly difficult economic calculations and the need to reduce the administrative staff. They quickly saw that it would be advantageous to them to buy personal computers and software. Lower level organizations—trusts and construction-installation administrations are especially active. In order to more quickly obtain automated systems, B. Shabelnikov, the deputy manager for economics at the Stalmontazh Trust and S. Voronko, chief of the Electrostal Construction-Installation Administration for this trust, actively worked on posing the tasks and developing draft plans for the system.

CAN THE WORK BE ON WORLD LEVELS?

[Question] Valentin Vasilevich, the mail to the editors shows that many readers are concerned that this may "ground" science. After all, research is always creative and full of risk. Soon everything will be determined only by "profitability" ["prybylnost"]. Won't the rush for profitability [rentabelnost] cause us to loose sight of the main thing—genuinely innovative developments which might at first loose money and therefore be unpopular with clients.

[Answer] Since the day it was founded, our institute, VNIINS, has been working on cost accounting. I cannot say that our research has been "grounded" because of this. About 40 percent of the work is done on state order, the remaining on direct contracts with clients. Cost accounting has caused us to work on large tasks of national economic significance. Ekibastuz railroad workers turned to us. Railroad transportation was delaying the development of this fuel and energy complex. It was really a sad picture. Even though there was an acute shortage of empty freight cars, every car was sitting idle more than 15 hours, waiting for documents to be filled out and to be loaded. This means that there could be no talk of increasing coal production. Our institute set about developing an automated management system which would reduce idle time. This system has been introduced. It puts consists together, informs stations on time and processes all information. This system's introduction made it possible reduce the time needed to process consists, saving more than 1 million freight car hours annually.

Our order box is now overflowing. This is greatly helped by a principle which we have been using for eight years—we orient ourselves only towards world levels. We lag behind progressive nations in computer technology and information science. Therefore it makes no sense at all to stipulate that any automation system being delivered exceed all similar models in our country. It may be the best in the USSR, but it lags behind those delivered from the United States or Japan.

It is fruitful to set world standards as our goal. Recently, after an offer from the well known Italian firm Olivetti, our institute signed a contract for joint work on preparing software and supplying it to the world market. There are similar offers from firmes in other countries. Sixty percent of the automated systems produced by the institute conform to world levels. It is difficult to do better right now. There is not enought equipment. However, 40 percent of output is below world levels. This means that in the West, the institute would simply go bankrupt.

We sometimes lose heart when clients themselves do not make strict demands upon systems being delivered. We had to introduce internal quality control. Often decisions approved by a client are not approved at the Institute's scientific council. This is because organizations with which we have started dealing have no specialists on computer technology and automated management systems. Doctors or builders have no chances to learn about computers' potentials. Imperfections in the economic management mechanism are another reason for some clients' low standards. After all, by having spent money on an automated system they have fulfilled their plan for the introduction of new technology! They are indifferent about the price and sometimes even try to overpay us!

The situation will change immediately when a system's cost becomes part of production costs and the annual economic effect part of the profit plan. Then organizations will immediately begin to count money and obtain more from it. Then the situation involving us and USSR Gosbank and the Gostrudsberkass [State Workers' Savings Bank] Moscow Administration will be an ananchronism from the past.

What happened? USSR Gosbank ordered a large project for automating the management of savings banks in the capital. It not only wanted a several fold increase in the labor productivity of savings bank workers, but also wanted to expand the range of services. After all, it is no secret that although Gosbank is the world's largest, it provides far fewer services to its customers than do banks in other countries. We quite quickly worked out a draft plan for this system. It was introduced as an experiment in Sevastopolskiy Rayon in the city. It showed its promise in the first months of operation. The USSR Gostrudsberkass recommended applying the the system to all rayons in the capital, but the Moscow Administration announced that it did not need such a system. They said they "had not ordered the system and that its introduction would require extensive preparations, for which they did not the resources."

I will not now try to estimate the losses from not copying such a system throughout the entire city. The old economic management practices permitted paying 1.5 million rubles for a system without having to show any great concern about its future use.

In some final words about cost accounting I want to say something about the new financing procedure described in the decree. Institutes will have considerably greater potentials. In addition to bank credits, scientific research institutes are authorized to have their own resources, which are formed from their profits. The institutes themselves will decide how they spend this money. It can be used for the acquisition of equipment, testing new ideas, creating reserves of completed work, or for improving housing conditions for scientific workers and granting them bonuses. It is also foreseen that scientific research institutes will earn foreign exchange by selling their products abroad. Ministries will no longer have the right to take these earnings, as they did before.

I will stop here, and "descend from the sky to the earth." What is the situation now? The most important efficiency indicator is the normative for the formation of the wages fund. The collective's income, and, consequently the well-being of the entire institute depend directly upon this. Without knowning this normative it is impossible to conduct a contract campaign and formulate a plan. The rules for calculating this normative were first officially formulated on 2 November 1987 in the temporary recommendations approved by the USSR GKNT, USSR Gosplan and the USSR Ministry of Finance. The methodology for our Ministry of the Machine Tool and Tool Building Industry naturally appeared somewhat later. As a result there was very little time to formulate a plan. If a contract is not signed prior tothe beginning of the year, the bank can stop financing and cease providing money for wages. Even on 22 December there was confusion about state orders, wnich make up a substantial part of our work. This slowness causes difficulties for scientific research institutes.

The importance of the NII's economic sector is increasing as never before. VNIINS has been working on cost accounting for more than 15 years, therefore high demands have been made upon the planning department and upon the accountants' office. We have tried to staff them with qualified specialists. Nevertheless, we had to introduce a new position—institute chief economist. He became one of the most energetic workers, a candidate of economic sciences. He had to use the help of another group of specialists. These are substantial expenditures, after all, these people could be working in science. However, these expenditures are justified. I can say this because other NIIs have asked us about this.

Or take another problem. Under the new conditions institutes, just as industrial enterprises, really can earn sizable sums. But how can they be realized? This is still contradicted by the procedure for establishing funds and limits on material-technical resources. There is a real danger of increasing the gap between supply and effective demand. This question must be examined.

PROGRAM FOR AN ENGINEERING CENTER

[Question] In talking about the problems in sectoral science, we focused your attention around the NII, however, its efficiency is to a great extent determined by the work intensity of each individual associate.

[Answer] Of course, cost accounting only creates the conditions under which the institute can begin to more rigorously consider "who, what and how." First priority goes to the system of incentives, not only material, but also moral. Unfortunately, for many years sectoral science has had an incentive system which was introduced during the first five-year plans.

What advancements were offered to a young talented (I stress the talented) VUZ graduate? He moved step by step up the ladder at a sectoral NII—engineer, senior engineer and finally, after defending a dissertation, senior scientific associate. Here, eight years after graduating from the VUz, his career in science ended. No matter how well he worked, there was only one way to provide incentives—to appoint him head of laboratory, latter of a department and division, that is, to make him a manager! Thus, we often lost good scientists and acquired bad administrators.

There was an equally sad situation with an incapable associate lacking in initiative. With each promotion he occupied a solid bastion. It was not thought possible to throw him out. No matter what he did, if he did not get drunk on the job, or show up late, he was assured a long quiet, even comfortable, existence. As far as I know, for many years material incentives in the country fluctuated mainly within 25 percent limits. An average worker received 100 percent, a do-nothing—75 percent and an excellent worker—125 percent. The system, which "averaged" everyone and dictated that relations not be spoiled with anyone, has not yet been overcome.

Nevertheless, the situation is beginning to change. Scientific organizations have converted to more progressive systems for paying labor. New positions have been introduced: leading and chief associates. The earnings of a chief scientific associate, who must have a doctorate, are close to the salary of an NII director. We can no longer "hatch out" petty and generally good for nothing institute heads, but must let researchers be directly involved in their work. At our NII, when leaders [rukovoditeli] were given the possibility of switching to purely scientific work without loss of pay more than one-fourth of them agreed, and eagerly at that. There authority did not suffer, they still remained leaders [lidery]. It was decided to close some of the laboratories all together. They had been created as some "commander's" chair.

Material incentives are now provided in ways other than the new positions. All changes in salaries at VNIINS in the past 18 months (and during this time associates' earnings have increased 30 percent) are linked to the successful completion of themes. What does successful mean? I have already said that we are trying to oriente ourselves towards world levels. A theme is considered

successfully completed only if the decisively important tasks are done to this level. If the system created does not satisfy these requirements, then the developers are not awarded any bonuses or salary increases. The evaluation is made by an interdepartmental commission, not the institute.

Cost accounting also makes it possible to more actively use social funds. Incidentally, ours are quite large. We have used them to build a tourist hotel on the banks of the Volga, purchase modern sports equipment, including skies and yachts. Now we are looking into the possibilities of using our resources to provide housing for institute associates.

Unfortunately, the system of "incentives for the best" is better thought out than that of "punishing the laggers". Today a scientific associate or engineer who has exhausted his potentials can still quietly occupy his, or more accurately, someone else's post. Under cost accounting this will be very costly to a scientific organization. Institutes which informally certify asociations cannot completely rid themselves of ballast. Those who have been released for incompetence, insufficient professionalism or lack of results are able to return to work after one or two attempts.

I think that the main reason for this is that we hurried to conduct mass certification of associates, without first putting institutes on full cost accounting and self-financing. The new economic management conditions enhance the the scientist-creator's role and reveal his business skills. The returns from each individual become more noticeable. Starting on 1 January 1988, when NIIs and design offices, together with their sectors start gradually converting to cost accounting it will be possible to have more flexible cadre policies. I think that in the foreseeable future the number of research workers in sectoral science will decline by 30-40 percent, while returns will increase by this much.

Because of this we have to make structural changes in sectoral science. Today the work of NIIs, design offices and Scientific Production Associations is structured quite traditionally. A group of associates in a single institute work on a theme, more or less completing it, and then begin a new one. And so it goes. The themes can differ in cost and importance. However, as a rule a problem is formulated and the amount of work required to solve it is determined by specific collectives, that is, those running on present intellectual resources. It should be the reverse. The problem should determine the make up and qualifications of scientific associates. By this I mean temporary collectives. These can be made up of scientists in various specialities and at various levels, but united by one specific task. Having solved it, the collective ceases to exist, but the scientists engage in new problems.

The Giprorybflot [State Planning and Design Institute for the Fishing Fleet] has interesting experience in this regard. When it was required to quickly develop a processing line for new types of canned items at the Pishchevik Fish Kombinat, a temporary collective was set up at the NII. Its core was 17 associates at the institute. When necessary additional work force was added, sometimes up to 30 people, however, only if really necessary. This type of organization and tested incentives made possible a many fold increase in the productivity of each working minute. As a result, more than 70 units of equipment have been created, two-thirds of which are the first in this country or the world. However, I did not talk about temporary collectives because I wanted to stress their prospects. These have already been noted in CPSU Central Committee and USSR Council of Ministers decrees. In my view, all sectoral institutes should convert to temporary structures. What does this mean? A small staff of permanent associates is part of an NII. The remaining part is a group of scientists or individual specialists, enlisted to work on specific problems. The "variable" part of the institute, consisting of workers on contract, can be larger than the main part. With such an organization ideas can be exchanged, skills improve and there can be competition among researchers.

We are now organizing the engineering center at our institute according to this principle. We have sent a whole series of computer programs we developed to be copied by Tsentrprogrammsistem [Central Program Systems] at Minpribor. As far as I know so far not one of them has received widespread application. We are not deluged by customers wanting to buy these programming products. I do not think this is accidental. A program package can be compared to a new unique dress design. When it is sold, it always has to be fitted, something which can be done by the designer. The experience of the most popular sewing firms proves this. These firms are setting up tailor shops, in which items are sold and fitted. Our engineering center performs similar functions. We are now developing automated management systems for clerical work, personnel departments, and other purposes for several ministries and agencies. We still create these systems individually for each order as if it were a new one, although basically they differ only in detail. The engineering center will fit a standard system to a specific agencie. The center is made up of a small group of permanent associates from the institute, which, when necessary, organized temporary brigades.

I think that contract work in no way infringes upon the rights of creative people. Trade unions, and society will protect their interests. There is a prototype for the contract system—the relationship between writers and poets with publishing houses, dramatists with theaters and directors with studios.

In restructuring sectoral science we should not forget people who got into science accidentally. I am not talking about do-nothings, it is clear what to do with them, but

about those who overestimated their powers and are not suited for creative work but for work in production. They have to get out of scientific research institutes. However, it is important that society not loose such people. It must not simply place them in new jobs, but help them find new professions. Ministries are now merging and there will be a 50 percent reduction in administrative staff. By 1990 about 60,000 people should be transferred to the new work. So far there are only preliminary plans for labor placement. As sectoral science is reorganized the problems will become much more complicated. Based upon our society's humanism, we must now think about this. In the temporary collectives set up in our institute each associate's efficiency influences his bonuses. Even this weak dependence (a position's salary remains unchanged) upon final results has lead to 30 out of a little more than 100 people having "nothing to do." We are now looking for ways to use them. There will apparently be attempts to reclassify people, but it is very difficult to solve these questions within a sincle NII.

There is still not complete clarity about many questions in the "new life" of NII. However, I do not see anything frightening about this, it has always happened during an epoch of revolutionary transformations. Life will boldly drag theory along.

11574

Courses in Technical Creativity Introduced at Volgograd

18140259 Moscow SOVETSKAYA ROSSIYA in Russian 28 Apr 88 p 1

[Article by A.I. Polovinkin, doctor of technical sciences, professor: "The Cradle of Creativity"]

[Text] **It is thought that the acceleration of scientific and technical progres requires a much higher creative return from specialists, engineers, scientists and designers. However, I do not know a single VUZ where creativity is taught. Ninety nine percent of work in production and design offices is simply routine. I do not want to get into a detailed discussion of the reasons for this: the plan, the push for gross output, lack of material stimuli, etc.**

I want to talk about something else. When one sees the high quality products of Western firms one understands that they could not have been created if engineering creativity had not been "on the line." Clearly, they have some sort of system for teaching scientific-technical creativity there. Perhaps it would be worth it for us to imitate it? Or is there such a system here, but we simply don't know about it? A. Grinko, Engineer, Moscow

Our correspondent T. Pavlova asked Professor A.I. Polovinkin, doctor of technical sciences and rector of the Volgograd Polytechnic Institute to comment upon this question. Aleksandr Ivanovich is also chairman of the "Euristika" Scientific-Methodological Council at the Central Council of VOIR [All-Union Society of Inventors and Rationalizers] and RSFSR Minvuz [Ministry of Higher and Secondary Specialized Education].

Recently there has appeared a complex of methods and means which will help increase the creative output of engineers and specialists by several fold. Much now depends upon how we in VUZes organize continuous broad training in these methods and means and at the same time solve practical tasks. This essentially refers to a goal directed culture and habits of creativity among students, engineers and designers, everybody who is studying at VUZes or going to them for retaining.

It should be noted that engineering VUZes are not accustomed to this. At the recent VOIR Congress I had a detailed discussion with Professor Vzyatyshev from the Moscow Power Engineering Institute. For two years now Viktor Feodosiyevich has been seriously engaged in developing engineering creativity a that VUZ. We pointed out that even the concept of engineering and technical creativity has been lost at the educational work of departments.

As a result each year only 1 out of 7 specialists with higher and secondary technical education makes an innovative proposal. Ninety eight percent of all developments are only efficiency proposals and are not innovations on a world scale. As I have already said, there is an extensive collection of presently unused methods and means for improving people's creative potential.

Two years ago we created a faculty for retraining enterprise specialists. We had a small admissions plan—100 people. We immediately required that before coming to us, each student had to find a task requiring solution. This was to be found jointly with managers and chief specialists.

We spend half the time teaching theory and during the other half our teachers and students work on this actual task. It must be admitted that not all teachers can work on this faculty, where new and greater demands are made upon them.

Here is an example. Two women from a new plant arrived at the faculty to study scientific-technical creativity. Six months later one of them made a patentable proposal. They have already begun to work on drawings for a device to move semifabricated items.

We later asked her if she was satisfied with the work she had done here for six months. She answered: "For almost 20 years I have sat in the corner of a room where flowcharts were prepared from 4 handbooks. This is routine work which a 10th grader quickly master. Now, for the first time, I have learned that this is also design and engineering work."

In my opinion this indicates that unfortunately we think in stereotypes, considering creativity a matter for the elect, a secret guarded by seven seals, a gift from God. In fact, any thinking person is capable of creative thinking, and, more importantly, creativity can be taught. In this I completely agree with the author of the letter.

Our "Evristika" Council is engaged in developing new technology for increasing creative potential and introducing innovations. What useful things have we done in the five years of the council's existence? More than a dozen books and brochures on engineering-technical creativity have been published, including some on the laws and patterns of technology forming the theoretical basis for inventions. There is no similar work abroad. We have developed more than a dozen computer systems for supporting technical creativity. These are simultaneously a powerful way to intensify training and strengthen people's creative initiative. According to foreign specialists, there is nothing like these information systems anywhere in the world. They meet world standards. Finally, there are courses to train teachers in scientific-technical creativity. The introductory course "Methods of Scientific-Technical Creativity" is taught at more than 30 VUZes.

However, attempts to create a system for extensive and contining education in technical creativity have encountered problems which cannot be solved by the "Evristika" Council or the VOIR Central Council. For example many small issue or unpublished training and methodological aids have been accumulated. What is needed is a series of books and brochures "Library for the Creative Specialist and Worker" as for example in the Society for German Engineers, in the FRG.

We are convinced that a personal computer based information system is the most effective and promising way of expanding and strengthening creative activity. As I have stated, we have created one which meets the best world standards.

Two years ago, the main institute for this problem, the Volgograd Polytechnic Institute, together with the "Evristika" Council asked the USSR GKNT [State Committee for Science and Technology] to create a scientific research institute for computerizing engineering creativity. This proposal was supported by all interested parties, but, in the final account, the GKNT killed this good idea.

Now I will talk about imitating good foreign experience.

The experiences in Ruse, a city in Bulgaria, was very useful to the Volgograd Institute. The Bulgarians are conducting night courses in current and very important topics, linking these to basic specialities and to course and diploma work. So we began training in the speciality "Improving the Technical Standards and Competitiveness of Products." Today many enterprises with modern equipment are not able to produce competitive products. They do not have the right approaches and methods, in short the system for creating such products. Secondly, we will teach marketing. What is this. Briefly, marketing is a system for studying the market and demand in order to orient production towards those goods which customers need and which will find sales. For 15-20 years the techniques of marketing have been a mandatory discipline in higher educational institutions in all developed countries. In our country up until recently social scientists sceptically called marketing "a panacea for the final stages of decay." Now we must direct this irony towards ourselves.

Of course, things are difficult at first. There are no textbooks. We are gathering scraps of relevant literature. Enthusiastic teachers were found to make up for it and to teach themselves and students.

We are introducing another important specialization—industrial design [dizayn]. We have not provided students with any general background in this area. It got to the point where an engineer-designer [konstruktor] could not talk to a professional designer [dizayner]. In short, we decided that those who were to take this additional specialization should master the ABC's of design [dizayn]. Of course, we selected those who were already able to draw, so that it would be easy for them to work with professionals.

There is one more small, but important step in our new comprehensive creative training of specialists. Starting in the next academic year we plan to introduce elective disciplines. In addition to a specified number of hours of compulsory subjects, student can select subjects in their speciality. Freedom of choice, this is a necessary component in creativity, either for an individual or society as a whole.

I recall how we at the institute developed a program for the comprehensive creative training of specialists. Initially we made the first draft, then there was a stormy three hour discussion. After this a second review and a third. Only the fourth draft was accepted by the collective. Interestingly, I. A. Novakov, the secretary of the institute's party organization, told me that the first draft was somewhat stronger than the latter ones. I only answered yes, of course, the first would have been preferred, but one that was approved made up for it by having general support. Although this was a small step, the entire collective made a step foreward.

11574

Hungarian Novotrade Innovation, Introducing Firm

18140245 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 4, 16 Feb-7 Mar 88 p 6

[Interview with Reni Gabor, general director of the Novotrade Innovation and Introducing Firm, by NTR: PROBLEMY I RESHENIYA correspondents Candidates of Economic Sciences S. Abramov and I. Oleynik under the rubric "Experience" (Budapest-Moscow): "The Shares of Novotrade"; date and occasion not given; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] The joint stock company—quite recently an indispensable attribute of capitalist economic management—is achieving today general recognition in our country. A joint stock company for the production of toys has already been established on the initiative of the All-Union Komsomol Central Committee, in Lvov the Konveyyer Scientific Production Association has issued shares for its workers, the Lvov Provesin Agricultural Firm has done the same thing. Everything seems to indicate that the introduction of joint stock companies in our life will acquire in the future a considerable scale. It is particularly important to link them with our "bottleneck"—the introduction of innovations. In the article of G. Gromov, which was published in the last issue of NTR, it was emphasized that the state is not capable of financing this activity—the risk of "going bankrupt" is too great. Here small cooperative firms, including joint stock companies, should become an active party. In our opinion, this thesis is also confirmed by the experience of Hungary, where similar forms of cooperation have existed for several years now. We offer to the attention of readers an interview of our correspondents with Reni Gabor, general director of Novotrade, one of the first innovation and introducing firms in Hungary.

[Question] What served as the stimulus for the establishment of Novotrade?

[Answer] Our society, just as other analogous ones, is the child of the Hungarian economic reform. It appeared when in the early 1980's the search for new means of increasing the economic efficiency of enterprises and organizations was stepped up.

Medium-sized and small enterprises, which are the majority in our country, are having the hardest time of all. It is much more difficult for them to find and to organize the production of new technically complex items, to obtain credit for this, and to purchase, even while having the assets, equipment and technologies abroad. So that the aspiration of labor collectives to invest earned assets profitably under the conditions of the increasing pressure of "market levers" served as a kind of "culture medium" for the establishment in Hungary of special innovation and introducing organizations.

[Question] Could you explain, if it can be said this way, the technology of the work of the company?

[Answer] Imagine that some enterprise has decided to produce a new item which, so it believes, will be in demand. But for this it does not have, let us assume, the necessary equipment, assets, and experienced specialists. What is to be done? We believe that it is necessary to turn to us, and on a equal basis or for a specific fee our specialists will assume the trouble, which is connected with the purchase of the necessary equipment, raw materials, components, and technology, with the setting up of production, and with the organization of advertising and marketing.

And this is just one version of the work with a client. We can ourselves suggest to an enterprise or cooperative items which, in our opinion, will find their own consumer. In this case we fully or partially finance their production and marketing and bear financing responsibility for potential failure. If losses have occurred through the fault of the partner, it is obliged to reimburse us for the entire caused loss. But then the profit is divided between us in accordance with a mutual understanding.

At the request of the client Novotrade makes a comprehensive appraisal of inventions and a search for the most promising innovations from the technical and commercial standpoints, organizes their introduction, provides engineering services, sets up the marketing of new items, and gives advice in the assimilation of the latest products and technologies. In all cases we, in reality, assume the commercial risk of bringing inventions up to the stage of industrial assimilation and marketing.

[Question] But in order to begin "business," were assets and probably considerable assets needed?

[Answer] Yes, of course. Novotrade is a joint stock company. And I believe that such organizations should be established at the expense of interested organizations, and not the state. By investing assets in shares, they obtain, first, a significantly greater profit than the bank profit and, second, a real opportunity to solve quickly the production and other problems that face them.

Therefore, for the formation of the initial "capital" we issued nearly 500 shares at 250,000 forints each. Today 4 large banks own 51 percent of the shares, about 100 interested enterprises and cooperatives own the rest. At the time of the establishment of the company, in 1983, we had 125 million forints, or about 7 million rubles.

Although our assets are formed from the dues of shareholders, we (I would like particularly to stress this) are a state enterprises, the activity of which is directed and monitored by the corresponding organs. However, they do not interfere in our work, in such "fetters" we would go bankrupt in a month. On the contrary, the management of the company enjoys full financial and operational independence and is accountable only to the meeting of shareholders.

True, such "freedom" also has another side: we cannot count on outright subsidies and compensation for losses. The profit, just as losses, is for us not of an abstract nature, but directly influences the income of the shareholders and the company itself.

[Question] And your wage as well?

[Answer] My wage, like that of all management personnel, is established in conformity with the prevailing rates in our country. But this does not mean that we automatically receive it in full, even if the company incurs losses. When things go well, the bonuses for everyone (and for me as well) reach 100 percent and even more of the annual wage fund.

Today the workers of the company receive twofold more than specialists of analogous skill in industry. We are thinking of beginning the sale of shares of the company to our staff members, in order to increase even more their personal contribution to the affairs of Novotrade.

[Question] What can you say about your staff members?

[Answer] Today about 80 people work in our central office, while more than 200 others are engaged in the organization of marketing and the service of equipment at affiliates.

Although the average age of workers does not exceed 30, many of them are prominent specialists in their field. As a rule, they conduct the work with the client from start to finish: they themselves seek promising inventions, organize their modification, find potential buyers, and set up production.

[Question] Is it true that, in many respects owing to the efforts of the company, in Hungary the task of computerizing the country is being successfully accomplished?

[Answer] I would say the following: we have made and are continuing to make a certain contribution to this matter. With our assistance more than 1,000 sets of computer hardware have been installed at enterprises. Several fold more personal computers have been sold to the population at a quite reasonable price at specialized stores, the establishment of which is also our service. Game programs are sold here. At the computer clubs, which have been opened by the company at stores, they will suggest with what to begin and will teach one to operate a computer.

Since the moment of formation we have dealt with the writing of programs for educational, home, and professional computers. We began with game programs for home "personals," including the development of the topic, graphics, and music and self-programming. Programmers, artists, musicians, and designers—there are about 200 of them—are working on contract with us. Today we have to our credit on the order of 70 original game programs.

We write custom programs for western firms. Particularly for such personal computers as the IBM PC, Atari, Apple, Macintosh, and Commodore. Of course, we are also participating in the development of programs for the domestic Videoton.

A new direction of our activity is the supply of schools with computer hardware and the coordination of the development of programs on educational themes. Whereas in 1986 we prepared about 150 educational programs, in 1987 for Videoton alone we developed nearly 100 educational and game programs.

[Question] A few words about the results of the activity in 1987.

[Answer] The results cannot but please us. After the payment of all taxes each shareholder will receive about 14 percent per annum. Moreover, from the introduction of innovations many shareholders have received an impact of 1 million forints.

The experience of Novotrade shows that initiative and enterprise, creative thought and technical knowledge can solve the most difficult problems that face various industrial enterprises. It is necessary merely to eliminate unjustified bureaucratic restrictions and to give people the opportunity to display their abilities.

[Question] What can you say about cooperation with Soviet organizations?

[Answer] We are ready to discuss and to respond not only in words to all mutually advantageous suggestions of interested organizations and enterprises on the establishment of cooperation in any fields, including the opening of affiliates of Novotrade in the Soviet Union.

At one time we proposed to organize the production of game programs and programs of the optimization of the consumption of fuel and energy resources and the joint output of products of biotechnology. I hope that the changes that are taking place in your country, including in the foreign economic sphere, will increase the interest of the parties in the development of mutually advantageous cooperation.

7807

Auction of Scientific Ideas at Institute of Chemical Engineering

18140229 Moscow MOSCOW NEWS in English 6-13 Mar 88 p 10

[Article by Ilya Borisov under the rubric "For the First Time:" "Ideas for Sale"]

[Text] An auction of scientific-technical ideas and R&D work at the Moscow Institute of Chemical Engineering.

The auction started with a pleasant surprise: none of the lecture-halls could seat even half the people who had come to attend. Well, none of the organizers had ever handled auction idea before.... Directors of enterprises,

chief engineers, shop superintendents, laboratory heads, chiefs of factory departments and the hosts—the Institute's leading scientists—filled the conference-hall to capacity.

The excitement over the auction and the ballyhoo are perfectly understandable. The USSR has no market for ideas in the applied sciences. There is no system for prompt notification about R&D work which is complete and ready for use in industry. The various publications—collected abstracts and specialized journals—contain far from all useful ideas. Besides, an article in a journal may not tell you everything you want to know. If you want more information, you have to track down the author's address, write a letter—meanwhile time is going by. Another important point is the commercial validity of the new idea. This, of course, depends on finding the right buyer. Hence, an unsatisfied demand may be languishing in one place, a splendid idea in another.

The auction at the Moscow Institute of Chemical Engineering was held by experts on polymers—headed by the Institute's Rector, Prof. Nikolai Basov. First the guests (clients, partners and potential buyers) were acquainted with these new ideas "ready for use," then they were taken on a tour of life-size models, products and equipment....

The trade was brisk. Deals were struck one after the other. The Institute sold research and engineering specifications for equipment, technological processes and instruments at contractual prices. Economic agreements and contracts on socialist cooperation, loans of software were also concluded....

Assistant Professor Valery Lyubartovich, one of the originators of the auction idea, says:

"New operating conditions in industry—cost accounting, self-repayment—are naturally a powerful means of raising labour efficiency. But now plants are mainly concerned about financing their immediate needs and taking care of their immediate aims."

We have already felt this: the number of buyers has decreased. But our science students are working for the future. Only an auction can give an enterprise an opportunity to assess promising R&D work, to observe it up close and see that it's no pig in a poke.

There is also one hidden advantage to an auction. Often a plant, having learned about an improved technology which would reduce the cost of output, does everything it can to resist the new idea. Why go to all the trouble of revamping the system if the customer has always bought and will continue to buy the product at any price? But if a client sees an alternative solution, he may put pressure on his supplier or change suppliers. Could this be the end of the diktat of sluggish managers?

A week after the auction ended, the first results were in: three agreements on cooperation signed and another seven ready for signing.

According to Rector Nikolai Basov, these auctions will occur regularly in future, and foreign partners will likely participate as well.

Andrey Alekseyevich Trofimuk
18140140 Moscow PRAVDA in Russian 1 Dec 87 pp 3, 6

[Article by PRAVDA correspondent Ye. Solomenko under the rubric "About the Country of Soviets:" "A Map of His Life"]

[Text] "How is that, Viktor Ivanovich? Really, did you intend to leave the party? Why?"

They sat opposite each other—two middle-aged men, two veterans of their Novosibirsk Academy Campus. One is Academician Andrey Alekseyevich Trofimuk, deputy chairman of the Siberian Department of the USSR Academy of Sciences and director of the Institute of Geology and Geophysics, the other is highly skilled worker Viktor Ivanovich Volkov. An electrician, he is a carpenter, he is a fitter, he is the permanent editor of the wall newspaper AKhO. Golden hands, a golden heart, and how do you like that!—a written request: "I request that I be removed from the ranks of the CPSU...." Trofimuk still simply could not understand: Why?

"It is a waste of time to chatter there, Alekseich!" Volkov sighed. "I have gotten old: I am 70 and then some—this, you yourself understand, is not child's play. I can no longer work as in previous years—at full throttle. But I do not want to become ballast in the party, and there is enough of it there without me!"

"But I will be older than you. Why, am I also to lay my party card on the table?" the director looked him in the eye. "It is necessary to live in the party, to breath, to fight. And people do not retire from the party."

And silence entered the office. It last 1-1.5 minutes, no longer. And then the gray-haired worker rose, just as quietly took from the desk his "work" and tore it into pieces. He reached the door stooped over and there sighed:

"Forgive me, Andrey Alekseyevich: some kind of nonsense overcame me. And really, I am getting old. Forgive and forget!"

The door closed behind him. Trofimuk remained alone. And it seemed: there is neither a desk nor an office, but there are the yellow October woods and the spacious plains of Bashkiria, where the communists of the Ishimbayneft Trust are admitting him, their main geologist, to the All-Union Communist Party (of Bolsheviks). And the disturbing winds from the west, it seems, bear the smell of conflagration—the piercing winds of October 1941.

During the same troubled year he predicted a deposit in the region of Kuganak, where ancient coral reefs were hidden under the earth. These reefs, according to the calculations of Trofimuk, should also have yielded much petroleum! But he stood at the drill site, and the well "was silent." An empty well is like an empty grave, and he had to bury in it his dream and the hope of the fronts, which were experiencing more and more urgently a shortage of fuel.

But an angry command had already flown "from above":

"Stop chasing shadows! You yourself know what the situation at the fronts is like. With what will we refuel tanks and airplanes? Petroleum—even though a little, but reliable—is needed. So switch quickly to the working of already explored reserves!"

But calculations and a mysterious sixth sense suggested to him: Kuganak should yield petroleum. And Trofimuk did not fulfill the order. Of course, he understood with what this threatened him in accordance with the laws of wartime! Was it frightening? And how! He as if stood up straight under the bullets and attacked. But, it seems, it is so easy: fulfill the order, do not try to be clever and do not be self-willed! But the party card in his pocket and the distant cannonade in the west did not allow him to hide in the safety trench of passive obedience. And at his own risk he continued the search at a greater depth.

And when the drill string had been sunk another 300 meters, a black flow gushed out! At that time Andrey Trofimuk really sensed for the first time: not without reason, not without reason was he ordered to be here, and not at the front.

After the Kuganak deposit he discovered and developed the Kinzebulatovskiy deposit. Then the Tuymazi deposit—one of the giants of the "second Baku," which had been predicted by I. Gubkin, in the Volga-Ural petroleum and gas basin. Giants, which satiated with fuel our fighters and bombers, "katyushas" and T-34's.

At 32 Trofimuk was the first among Soviet geologists to become a Hero of Socialist Labor, at 39 he was in charge of the entire geological service for prospecting for petroleum and gas in the country, and at 46 was elected an academician. Incidentally, first of all his days and nights, which were filled with prospecting and calculations, endless scamperings over endless taiga and tundra expanses, and newer and newer flows, which spurt merrily and furiously from the agitated earth, rushed on like a fast-moving avalanche. But afterwards his new titles, awards, and honors tried to catch up with this avalanche of innumerable affairs and concerns.

"At that time we all worked quickly," Andrey Alekseyevich recalls. "Now nearly entire decades are spent on settling a serious question. But in our country during the prewar and war years there was not that much time. As soon as the first flow began to gush, I as the main geologist immediately gave an estimate: 10 million tons! And in accordance with my 'verdict' the entire drilling army moved there: they begin to drill development wells, to bring in equipment, and so forth."

He spoke more than once about the need to speed up the pace from the highest rostrums, by which he caused many people displeasure.

He has in general complex relations with ministries. Now there has already been included in geological readers: the largest natural gas deposit on the planet—the Urengoy deposit. But in the 1960's economists of the Ministry of the Gas Industry objected to Trofimuk and his colleagues:

"It is unprofitable to pump gas from the northern part of Siberia!"

Reproaches were also heard in unison from economists of the Ministry of the Petroleum Industry:

"Why are you bothering with the forecasting and search for Tyumen petroleum? Even if the wells there yield in a day more than 100 tons of petroleum each, all the same this will be economically inadvisable—to haul petroleum from god-foresaken places!"

Other theoretical scientists also rose to attack him and passed an irrevocable verdict:

"In Western Siberia there cannot be any petroleum at all! In the northern latitudes the ancient seas were very poor in organic matter, so where will petroleum come from there now? What you are now engaged in is a waste of state assets!"

There were many of them—apprehensive people, anticipating people, and besiegers. But Trofimuk with his colleagues to this accompaniment substantiated the great prospects of Western Siberian petroleum and gas, outlined a strategy of the search for them, and went on!

By the end of this five-year plan Western Siberia will provide 70 percent of all domestic petroleum and gas. Today it is impossible to imagine our economy without these natural resources, which are being pumped day and night from the depths of the taiga and tundra.

But back in the 1970's, when the strategy of Trofimuk and his comrades in arms had already been embodied in powerful gushers, when black rivers rushed from here through pipes to the west, oh how far it still was from a "complete and final" victory! The fields were thoroughly neglected, the petroleum industry workers simply sent from Samotlor everything that it could give. They did not build, it is possible to believe, housing, they also did not build roads, they drastically reduced exploratory drilling. They lived for today, no one was about to develop and construct in earnest and for a long time the surface facilities of these fields:

"Tyumen is flowing—and splendidly! Well, what next? When the gushers dry up, then we will think...."

This was in 1979. First Deputy Chairman of the Siberian Department of the USSR Academy of Sciences Trofimuk came to the member of the Politburo of the CPSU Central Committee, who looked after industry:

"In Western Siberia a golden river is flowing, every year there is exceptional income for the national economy. But there we have such disgraceful conditions that people are fleeing aimlessly from there."

"Well, what do you want?" the boss of the office got up from the desk and, having gone up to the window, halted expectantly.

"I want you to use there the same methods as on the Baykal-Amur Railway Line. Surely, the entire country is riding and flying on Siberian petroleum, but you will not find anyone to help the Tyumen petroleum industry workers! Here we have prepared a memorandum with specific suggestions and calculations. The gain is colossal, and in the most foreseeable future."

Soon the entire country joined most actively in the development of the Western Siberian petroleum fields.

Academician.... This very word breathes the imposing quietness of libraries and the silence of spacious offices with bookshelves to the very ceiling. In the life of Andrey Alekseyevich Trofimuk the silence of vigilant watches alone with a document incessantly alternates with the sleepless droning of motors at boreholes; with fiery polemics, which goes as far as shouting, at all sorts of conferences and collegiums; with the angry roar of the waves of insulted Baykal....

Today his basic works on the theory of the formation of petroleum and gas and on methods of their exploration and prospecting have received recognition among scientists of the entire world. Thus, Andrey Alekseyevich jointly with his colleagues substantiated the possibility of finding in the earth's crust hydrocarbon gases, which are in the solid phase in the form of compounds with water—gas-hydrates. And still he is rather not a theorist, but a practical worker. An academician-organizer, an academician-fighter. But it is more correct to say an academician-warrior.

The petroleum of Western Siberia had only just begun, but Trofimuk was already proving: the largest petroleum and gas resources lie in Eastern Siberia, prospecting work must be launched there! He substantiated the potential petroleum bearing capacity of the oldest sedimentary layers of our planet. And again he brought himself under fire on the part of many recognized authorities:

"Out of the question! These layers are more than 600 million years old, these are long dried up oldsters!"

Now more than 20 petroleum deposits, including the largest ones, have been discovered and explored in Eastern Siberia. Each of them is a monument, which was erected to the foresight and persistence of the Siberian academician during his lifetime.

The son of a Belorussian peasant farm laborer, purely outwardly he also looks to be "of the common people," there is nothing of a scientific patriarch in his appearance.

"There is 'programmed' in my character: silence is equivalent to treason. I should tell without fail the entire truth to him, on whom the settlement of a question depends."

And he tells it regardless of who is before him: a minister, a junior scientific associate, or a prominent political figure.

And here is "material evidence." A memorandum: "To the General Secretary of the CPSU Central Committee.... Circumstances force me a second time to turn to you on the question of preventing the pollution of Lake Baykal.... The conclusions of the Expert Commission are based on false evidence,...on unfounded assertions of workers of the Ministry of the Timber, Pulp and Paper, and Wood Processing Industry, which distort the essence of the matter...."

When the clouds of fatal, criminal indifference had thickened completely over the clear waters of Baykal, Trofimuk for the sake of saving the miracle lake decided to renounce his own creation—the Institute of Geology and Geophysics, which was nurtured by him and is one of the leading centers of world geological science. He submitted an application: he asked that he be switched to director of the Institute of Limnology—the main "executor" of Baykal. The community of the geology institute and scientists of the Novosibirsk Academy Campus appealed to the management of the oblast party committee: help stop Trofimuk!

But Trofimuk stood his ground:

"I consider it a matter of my own honor not to let Baykal die. There was a decision to strengthen the management of the Institute of Limnology. So let them strengthen it with me!"

In the end they told him in the central committee:

"Your duty is to remain in the capital of Siberian science, but from there you will also fight rather well for Baykal."

The latter is not a compliment. And really, if today it has been possible to build powerful treatment facilities at the Baykal Combine, to limit the felling of trees around the lake, and to restore the number of Baykal seal and the omul school, all this in many respects is due to this struggle of his.

Among the multitude of Siberian academicians Trofimuk is the only "patriarch" now in good health of those who in the 1950's on the appeal of the Central Committee at a site of the taiga built the Novosibirsk Academy Campus and established the Siberian Department of the USSR Academy of Sciences. Today he is the first deputy chairman of this department, permanent chief coordinator of the Sibir superprogram, and chairman of the scientific council for the problems of Baykal. At the institute, which was established and is headed by him, powerful scientific schools originated and grew strong: the school of Academician V. Sobolev, one of the discoverers of Yakut diamonds, the petrography school of Academician Yu. Kuznetsov, the school of seismic geophysicists of Academician N. Puzyrev, the paleontology and stratigraphy school of Academician B. Sokolov.... Pupils of the scientific school of Trofimuk work from Moscow to Kamchatka.

And here we are faced with a miraculous transformation. Would you really recognize the uncontrollable "fighter" and terror of ministerial offices in this thoughtful and extremely scrupulous tutor?

If the members of the institute scientific council do not accept the regular suggestion of their director, he will become angry and try to persuade them, then will convene the party group of the scientific council and will begin to enlist its members as allies, but will not allow himself to pound the desk with a dictatorial fist and to seal the verdict: "So be it!" How many times already their energetic and loud-voiced director has unconditionally obeyed the decisions of his unruly scientific council! And do many directors of institutes report back annually on their work to the entire collective? But for Trofimuk this is the law.

Recently V. Yermikov, one of the closest assistants of Andrey Alekseyevich, met in Irkutsk with John Maddox, the editor of an American scientific journal. He recalled something and laughed cheerfully:

"The Novosibirsk Institute of Geology? Ah, I was there in 1970. Is the director there a conservative, who did not believe in the theory of mobilism?"

"Perhaps, he did not," Valeriy Dmitriyevich calmly objected. "But during all these years at the institute of that very 'conservative' the laboratory of geotectonics successfully developed and has been developing the ideas of mobilism."

All of Trofimuk is in this: not to dictate, not to impose his own "only correct" views. And now, while preparing for the next election to the Academy of Sciences, he is nominating most vigorously to be academicians two prominent specialists. One of them is Ivan Ivanovich Nesterov, director of the Western Siberian Scientific Research Institute of Exploration of Geology, who for long years now has been a most active opponent of Andrey Alekseyevich in questions of where and how to search for petroleum and gas in Siberia.

"Well, what of the fact that he questions my ideas?" Trofimuk shrugs his shoulders. "But he is a talented scientist! And it is in the interests of the country that he become an academician."

How many things of all different kinds are going on around science! Tripping and intriguing, deals "you to me, I to you".... How he despises all this worthless trouble, all this "bedbug diplomacy"! In his 76 years Academician Trofimuk has never doubted the conviction that it is possible to do real science, just as it is possible to make a real revolution, only with clean hands. He is honest to the point of being overscrupulous, to the smallest details. If it is possible to express it this way, he is honest "in excess."

When in the Presidium of the Siberian Department of the USSR Academy of Sciences he was responsible for the distribution of housing, his own institute invariably received the most meager share of "meters." And within the institute he throws the least allocations and personnel of all to "his own" petroleum department. The most foul language could not reproach the director for the fact that he "pulls for his own direction" at the expense of all others. Trofimuk was one of the first among Novosibirsk academicians to hand over to others the laboratory headed by him. And then a university chair as well. And he is really a knight. An old knight without fear and reproach.

However, is he old? Take a look at him when he is singing songs at a hunters' campfire. This is once again a completely different Trofimuk, who is no longer familiar from his former hypostases. That his perpetual opponents from ministries would hear how this scholarly man, who is hoary with age, "delivers up" the humorous:

March on, march on, march on, my lads, march on through valleys, mountains, and ravines—we will go all the way, all the way to Chikaga!...

Indeed, in many respects he has remained the same as 30 and 40 years ago.... Venturesome, lively, light on his feet. He will bid farewell at times with colleagues and will leave with his wife on vacation somewhere in the Caucasus. But after a few days—bang!—a call from Moscow:

"Would you rush pretty quickly to me here the report on the northern part of Yakutia, which we discussed last week."

"Andrey Alekseyevich, how is it that you are at a sanatorium? You are on vacation!"

"What a vacation there, what a, go to the devil, sanatorium! Here our ministerial friends planned to cut the amounts of work, so a regular fight is taking shape...."

They say that a gypsy fortune teller will spread her cards, and they will tell her one's entire life. There is no need for him, Andrey Trofimuk, to go to fortune tellers. It hangs in his director's office—a map of his life, a large geological map of our large country.

You, the state, are great. And black rivers of petroleum and blue rivers of gas flow through your lands in pipes many kilometers long. While in the west, beyond the forests and swamps of his native Belorussia the city of Brest rested its stone ravelins against the very border of the country. There not far away at the beginning of the century his father worked as a farm laborer, there the newborn Andryukha Trofimuk announced this century with his first cry.

And here an intermittent long-distance phone call usually will break the short silence of his office and will divert him from contemplating the map of the country. The man behind the desk will lift the receiver:

"Yes, it is I. When will it be held? Yes, I will. Without fail. I will fly out tomorrow."

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Biographical Sketch of Latvian Academician R.Ya. Karklin

18140252 Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 2, Feb 88 pp 124-125

[Unsigned article: "Academician of the Latvian SSR Roman Yanovich Karklin Is 60 Years Old"]

[Text] On 22 February the noted scientist Professor Roman Yanovich Karklin, doctor of chemical sciences, academician of the Latvian SSR Academy of Sciences and Latvian SSR Honored Worker in Industry, will be 60 years old.

R.Ya. Karklin was born into a peasant's family in the Rayskumskiy Selsovet of Tsesisskiy Rayon. In Tsesisskaya Secondary School, R.Ya. Karklin already displayed a serious interest in chemistry, which determined his future path in life. In 1947, R.Ya. Karklin entered the Chemistry Department of Latvian State University. But even prior to graduating from Latvian State University, he joined the Riga Citric Acid Plant (founded in 1948).

At the plant, he wrote a diploma project which became a serious scientific study. The first independent steps of the young student experimenter received a broad response. In 1952, R.Ya. Karklin was awarded the USSR

State Prize for taking part in the development and introduction into production of a technology of microbiological production of citric acid from molasses.

On graduating from Latvian State University, R.Ya. Karklin received a proposal in 1952 to become the chief engineer of the Riga Citric Acid Plant.

One of the young chief engineer's first measures for radical improvement of microbiological production of organic acids was the development of methods of selecting highly productive strains of microorganisms.

The research conducted by R.Ya. Karklin at this time was aimed at increasing the economical aspect of biosynthesis of citric acid and improving the process of extracting the crystalline product. In 1960, he defended his candidate's dissertation "Uluchshennyy tekhnologicheskiy rezhim proizvodstva limonnoy kisloty iz melassy" [An Improved Technological Method of Producing Citric Acid from Molasses].

A series of works was conducted under R.Ya. Karklin's supervision studying the action of mineral substances on the process of formation of biomass for the producing agent [produtsent] and its biochemical activity and ways of forming byproduct acids depending on the conditions of cultivation of the producing agent and other aspects of biosynthesis of organic acids. The results of this research were generalized in a monograph "Biosintez organicheskikh kislot" [Biosynthesis of Organic Acids] (1972).

In 1960, R.Ya. Karklin organized a problem laboratory for itaconic acid and in 1961, it produced its first samples. In 1963, an itaconic-acid shop began to operate at the plant. Production of itaconic acid was started at the Olaynskiy Plant of Chemical Agents (now the Biolar Scientific-Production Association) and than at the Cherkassy Plant of Chemical Agents.

Under R.Ya. Karklin supervision, the selection of producing agents of itaconic acid was carried out and production conditions were developed for the fermentation and technology of formation of crystalline itaconic acid. For his participation in the development and introduction of a production technology for itaconic acid, R.Ya. Karklin was awarded the Latvian SSR State prize in 1965. In 1966, he was conferred the title of Latvin SSR Honored Worker in Industry.

Taking into consideration the high level of scientific research and experimental work, the plant was included in the system of the Latvin SSR Academy of Sciences as a production base of the Institute of Microbiology imeni Avgust Kirkhenshteyn.

At this time, several scientific-research laboratories of the Institute of Microbiology were organized at the plant's location under the methodological supervision of R.Ya. Karklin: a biotechnological, a chemical-engineering and an enzyme laboratory. The field of research work was expanded: in addition to mold fungi, biosynthesis of yeast is being developed with the aid of bacteria; depth [glubinnaya] fermentation and its special features are being studied; basically new equipment is being developed for the fermentation of deep-lying cultures; new methods are being introduced of producing chemically pure substances (ion-exchange technology, ultrafiltration, ultracentrifuging, electrodialysis and others).

R.Ya. Karklin takes part in the work of the Institute of Microbiology in the development of fodder lysine, nitragin [sic!—nitrogen (?)] and plant-growth stimulators.

Concurrently with this, he was engaged in the production of pure and especially pure biologically active substances by means of microbiological synthesis. Theoretical and experimental research was conducted on processes of ion exchange in chemical processing of fermentative solutions. As a result, methods were developed of producing pure amino acids.

In 1971, R.Ya. Karklin was awarded the title of doctor of chemical sciences.

At this time R.Ya. Karklin's cooperation begins with scientists of the Institute of Biochemistry and Physiology of Microorganisms of the USSR Academy of Sciences. An interesting and little studied aspect in biotechnology is at the center of their research efforts—control of the process of biosynthesis with the help of limiting one of the nutritive medium's components. As a result of jointly conducted integrated research, the possibilities were discovered of utilizing hydrocarbons from petroleum for the biosynthesis of organic acids—citric, isocitric, alphaketoglutaric and pyroracemic produced by yeast.

The development of industrial production of enzyme preparations with the aid of microbic synthesis is of theoretical and practical value. A technology was worked out of producing glucoamylase, clucooxydase, catalase, cellulase and other enzymes. The series of works on biosynthesis and extraction of pure amino acids—lysine, glutamic acid, tryptophane—is important.

Already in the'60s, R.Ya. Karklin turned his attention to the development of waste-free microbiological production operations. Under his supervision, a technology was developed and utilized of producing premixes, vitamin and mineral stimulators and feed additives for animal husbandry on the basis of byproducts of citric-acid production.

The results of the conducted scientific research and its practical application in biotechnology were generalized in the monograph "Biotekhnologiya microbnogo sinteza" [Biotechnology of Microbic Synthesis] (Riga, 1980) written by R.Ya. Karklin as a coauthor.

For his participation in the development and introduction into production of lysine premixes, R.Ya Karklin was awarded a second Latvian SSR State Prize in 1980.

Under R.Ya. Karklin's supervision in cooperation with the Institute of Wood Chemistry a number of preparations were synthesized for medicine,such as celnovocaine [tselnovokain] and celucarpine [tselukarpin], and with scientists of the Institute of Inorganic Chemistry preparations were produced for anticorrosion protection on the basis of products of microbic synthesis—borogluconate and a rust modifier.

The results of R.Ya. Karklin's theoretical and practical work in the field of development of microbiological production were reflected in the significantly increased output of citric acid and a number of other organic acids for the country as a whole. Selected producing agents of citric and itaconic acids and developed technologies were introduced at all of the plants in the country producing these acids.

The high indicators of the technological process of producing citric acid have also caught the interest of foreign firms. Enterprises and firms of France, Turkey, Yugoslavia, Czechoslovakia and Bulgaria have become partners on a licensed basis.

R.Ya. Karklin pays a great deal of attention to scientific organizational activity. He is chairman of the Latvian Branch of the All-Union Chemical Society imeni D.I. Mendeleyev, a member of the Board of the All-Union Scientific and Technical Society and an honorary member of the All-Union Microbiological Society.

R.Ya. Karklin is an instructor at the Intersectoral Institute for Upgrading the Qualifications of Specialists of the Economy of Latvian SSR. In 1970 he was conferred the title of professor. R.Ya. Karklin has published 5 textbooks for microbiological and biochemical specialists. He is the author of 225 publications and has more than 70 author's certificates and patents. Seven candidate's dissertations were prepared under his guidance.

Since 1982, Academician R.Ya. Karklin has been the director of the Experimental Plant of Biochemical Preparations of the Institute of Microbiology imeni Avgust Kirkhenshteyn of the Latvian SSR Academy of Sciences. He devotes his chief attention to the development of promising directions of scientific-research and experimental work at the plant and the quickesst possible introduction of scientific developments into the economy.

In party work. R.Ya. Karklin fulfills the duties of deputy secretary of the party committee of the Latvian SSR Academy of Sciences and chairman of the head group of the academy's people's control.

R.Ya. Karklin has been awarded the orders of the Labor Red Banner and the October Revolution and medals.

R.Ya. Karklin marks his 60 years full of creative ideas. We wish Roman Yanovich energy and new successes in his fruitful work.

7697